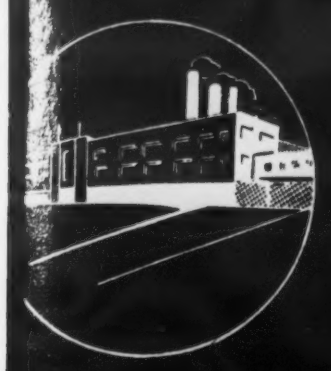

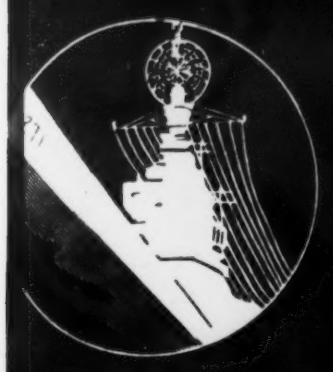

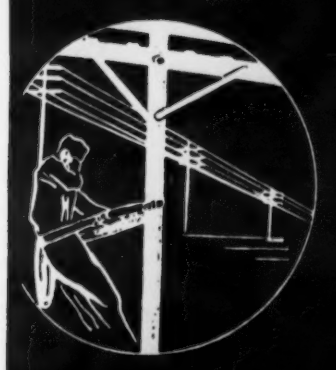

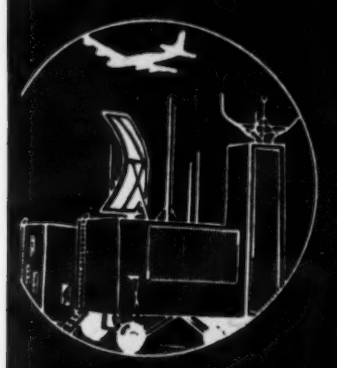

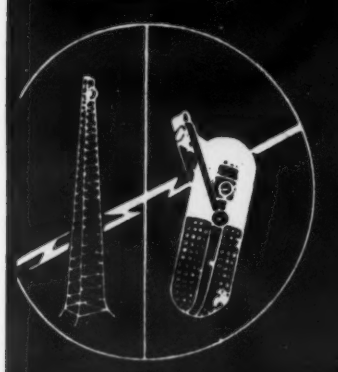

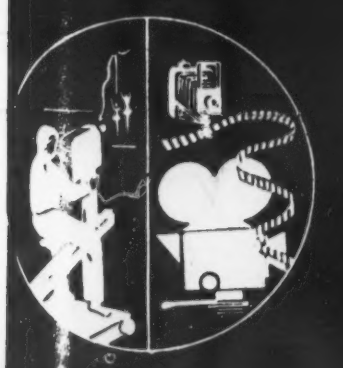

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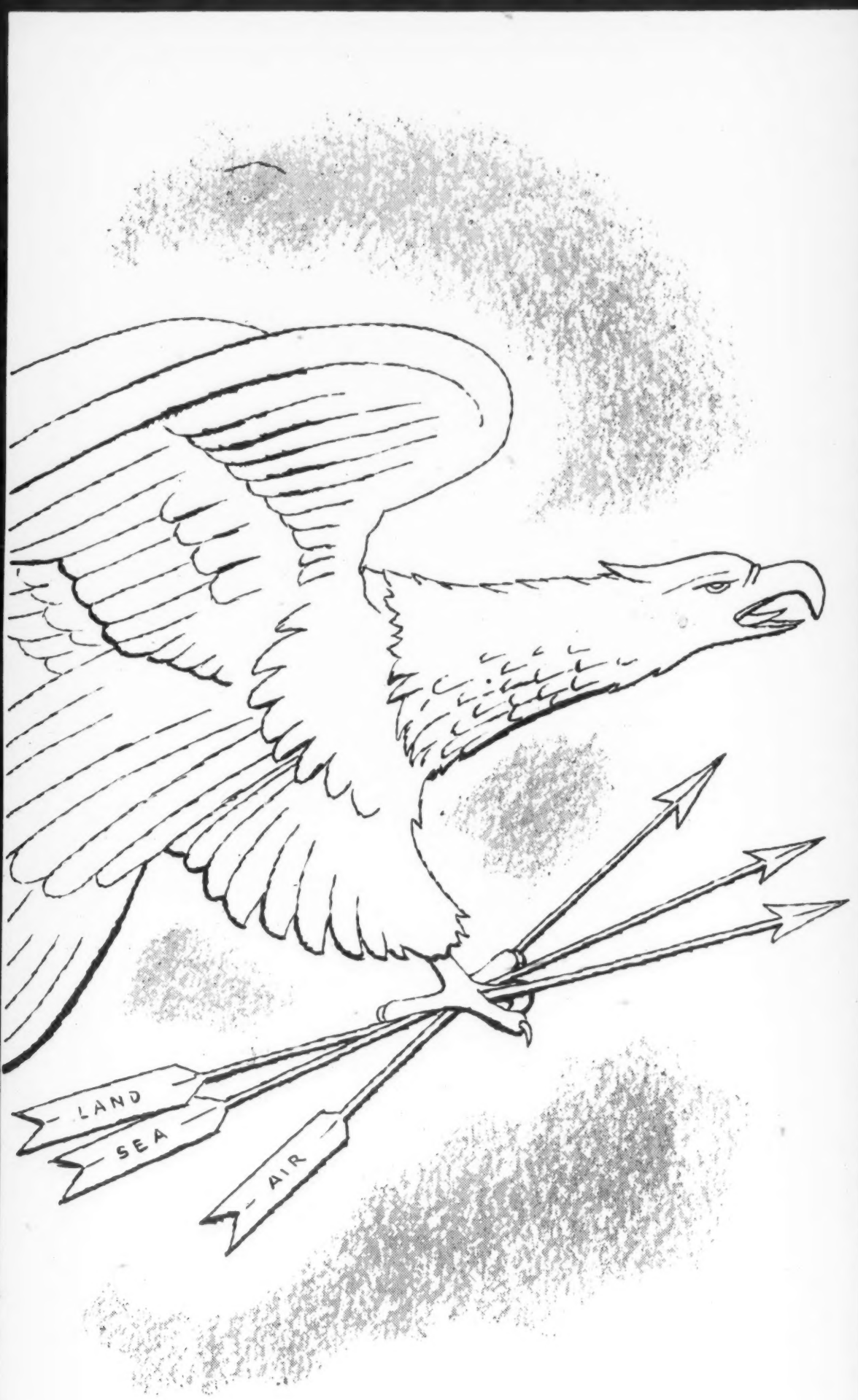

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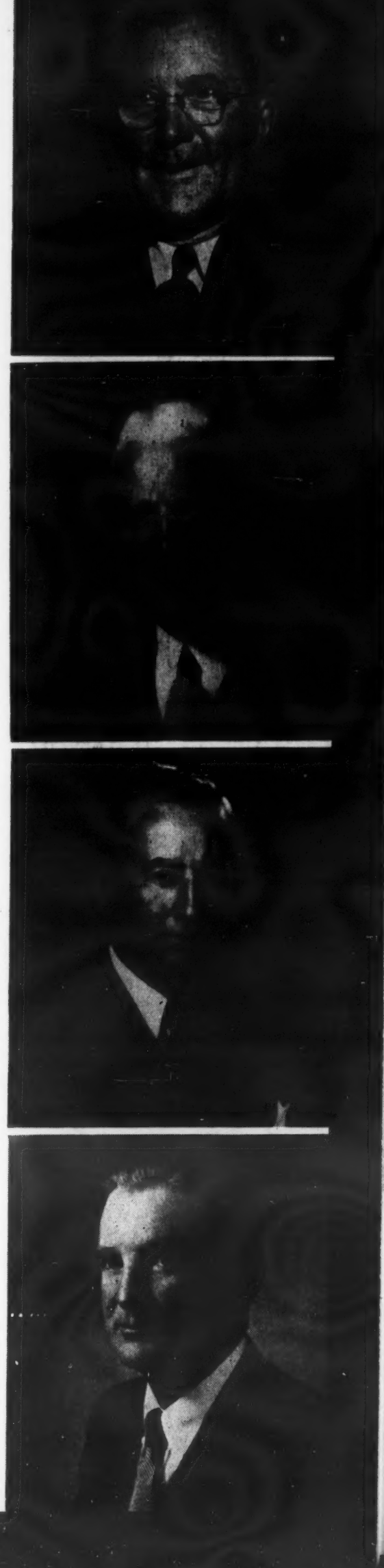

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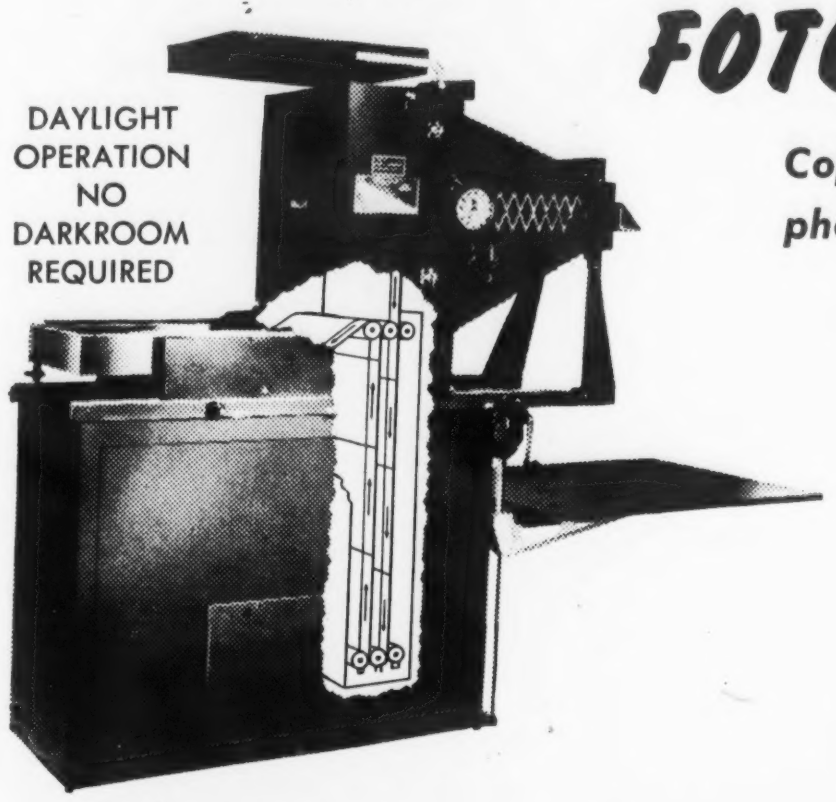

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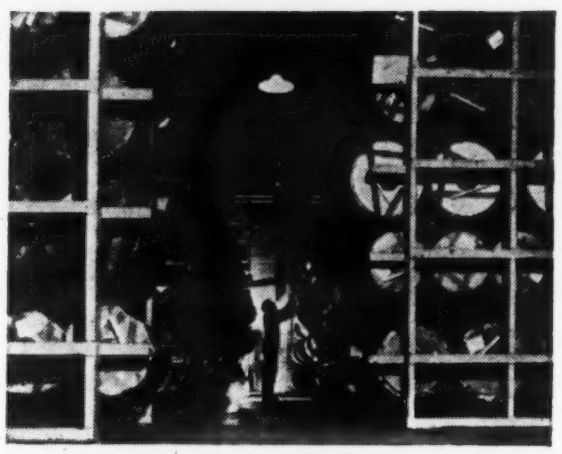

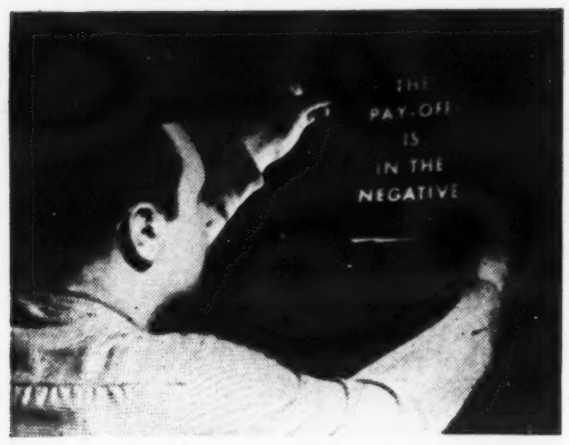

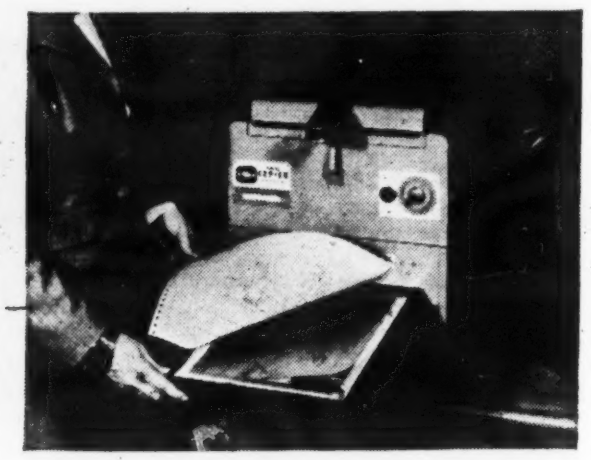

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THE COVER

Pictured on this issue's cover is the backfield of the team mobilizing the U. S. economy for military defense. Of especial interest to AFCA members should be the fact that all four of these mobilization directors have come to the government from the AFCA field of interest. From the top photo down, with immediate pre-government position given, are: Director Charles E. Wilson, Office of Defense Mobilization (president of General Electric Co.); Administrator William H. Harrison, Defense Production Administration (president of the International Telephone & Telegraph Corp.); Administrator Eric Johnston, Economic Stabilization Agency (president of the Motion Picture Assoc. of America); and Chairman W. Stuart Symington, National Security Resources Board (president and board chairman, Emerson Electric Mfg. Co.)

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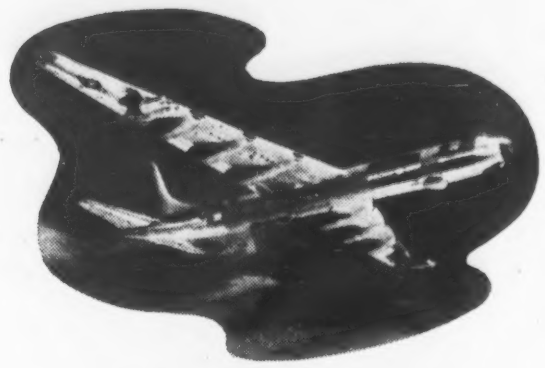

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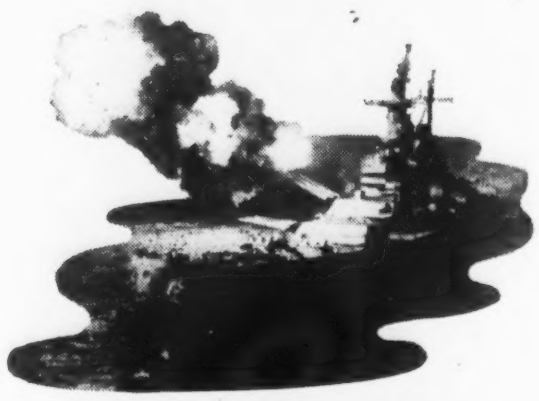

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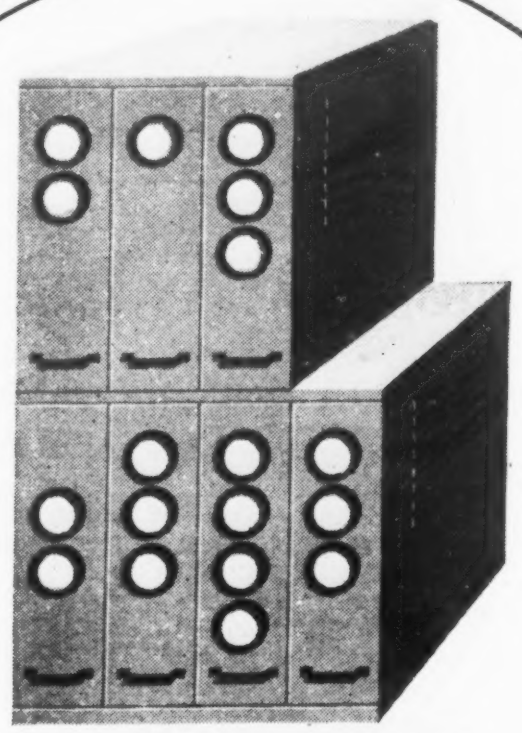

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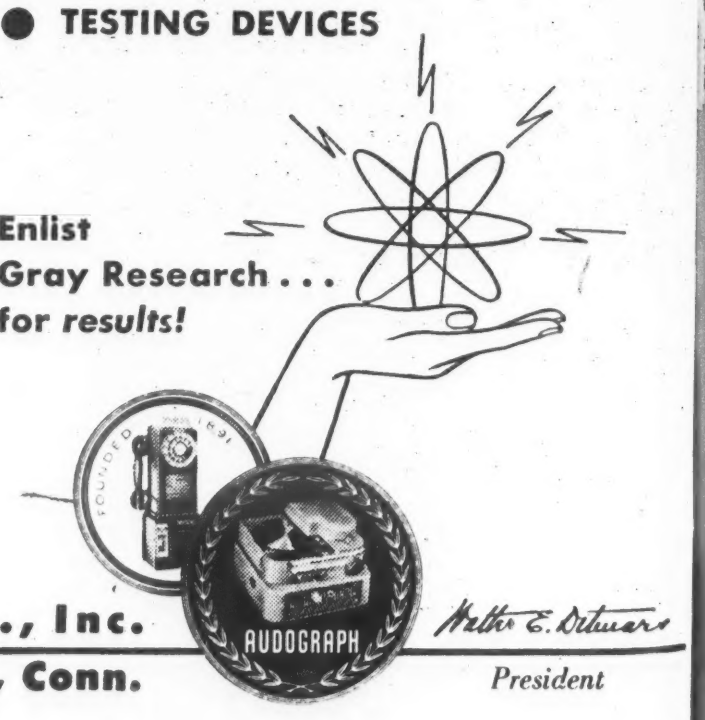

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A MULTI-CHANNEL RADIO LINK

Deutsches Mehrkanal Funkbrücke

By Lt. Colonel Loren E. Gaither

Signal Division, Hq., EUCOM

Prologue:

"At the present moment," Berlin seems destined to remain a large island in the middle of the Red Sea. All of which has imposed, until Then comes the Jubilee, a few problems here and there; communications not being excepted.

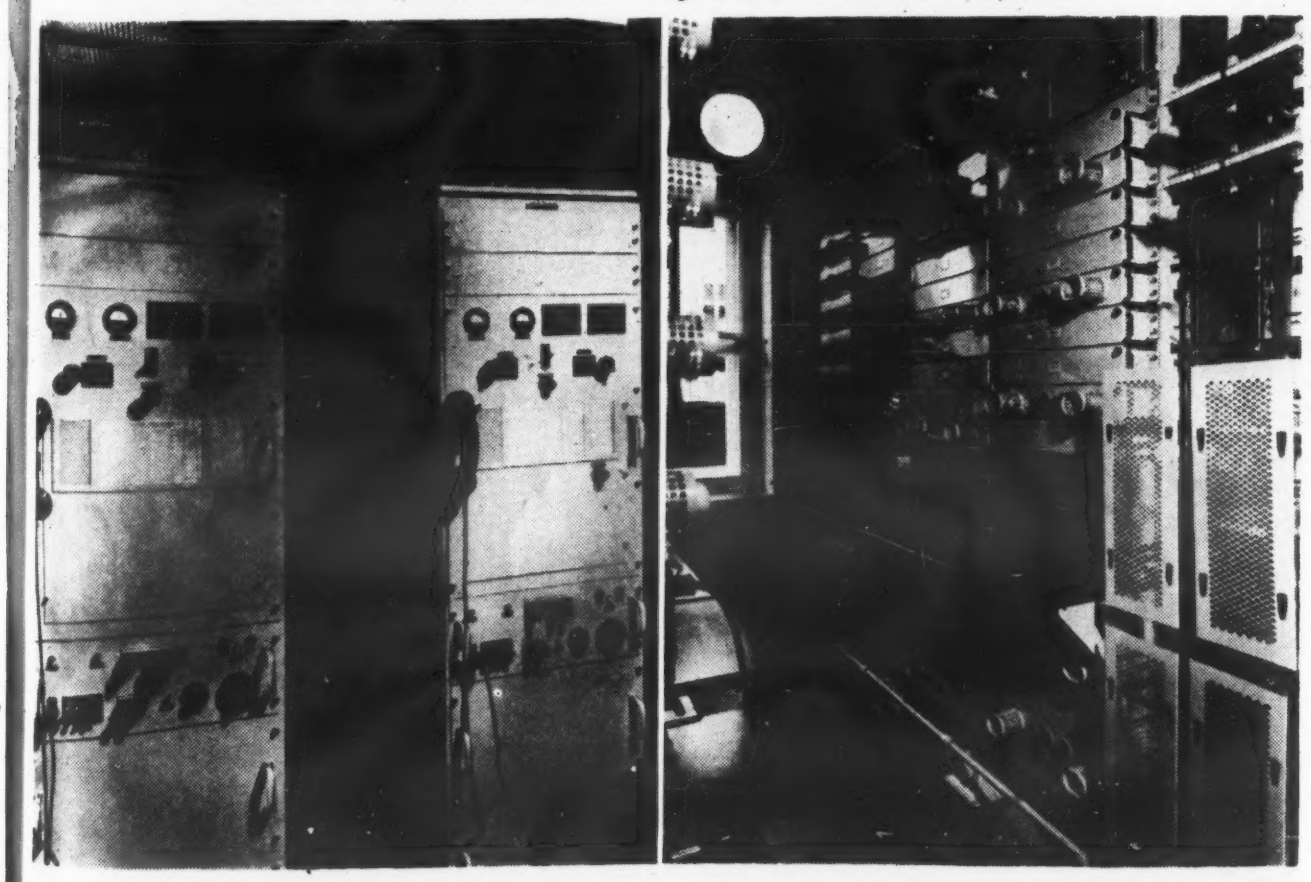
Looking through a 1949 peep-hole, the East-West communications situation definitely appeared to be both a productive and a prolonged seänce. Both parties obtained service; but a bit of table-rapping sufficed for the necessary business.

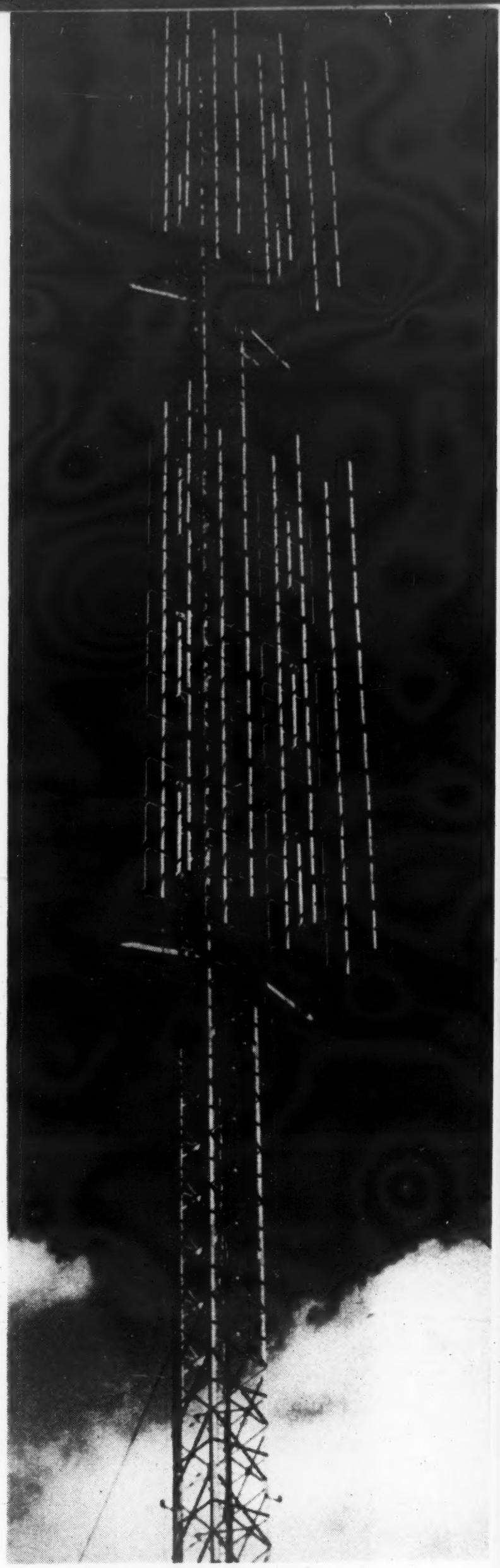
Land-line communications between the Western Zones and Berlin cross the East Zone and are, and have been for some time, operated by the personnel of the East Zone within the East Zone area. From the U. S. military viewpoint, all wire communications are contained in two cables: FK-12, between Hannover and Berlin; FK-14, between Ginnheim (Frankfurt/Main) and Berlin. Land-line communications between the Western Zones and Berlin are, and have been, in short supply from the viewpoint of German civilian usage and these wire communications are also operated by East Zone personnel within the East Zone.

The preceding factors indicated a need for multi-channel radio systems, as far back as you-know-when, between the British and the U. S. Zone and Berlin. Of course, multiple-channel, voice-frequency carrier systems exist on high-frequency radio channels but are rather awkward to handle. The use of multi-channel systems, using frequency-modulated equipment in the very-high-frequency band (30-300 Mc/s) is common and accepted but it does require, for best results, a quasi-optical path. Unfortunately, a line-of-sight path doesn't exist between Berlin and the Western Zones! BROCKEN (Elevation 3747 ft.) in the Harz Mountains, would offer such a path but this mountain is a few miles inside the East Zone.

The Deutsche Post (German Post Office, Telephone and Telegraph) under the direction of The Office, Military Government, U. S., was the first to take constructive action to create a multi-channel, voice radio system from Berlin to the West. The Deutsche Post program, as completed, consisted of three systems, each carrying 15 duplex voice circuits, from TORFHAUS (elevation 2730 ft.) which is, actually, a lower projection on the side of BROCKEN but which is in the West Zone. The TORFHAUS site is inferior to BROCKEN and superior to BOCKSBERG for VHF transmission to Berlin. The Deutsche Post equipment is conventional, consisting of 1200 watt transmitters and Tannebaum antennas. These antennas are conventional, stacked, wire-dipoles with driven, phased wire-reflectors. The circuits were found to be satisfactory for voice transmission, with a few short interruptions throughout the day which do not follow a definite pattern.

Below: Left; Berlin receivers. Right; MG-15 carrier equipment





Above: Top of 394 foot Berlin tower, with receiving and transmitting arrays.

The U. S. Army and the British Army

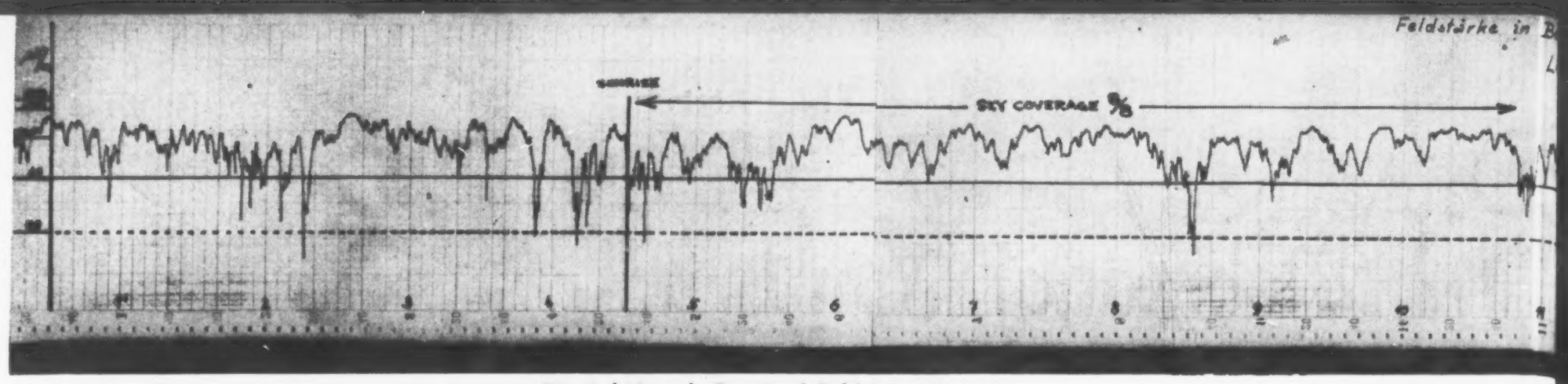


Fig. 4 (Above) Received field intensity curve . . .

were doing, in 1947 and 1948, some experimental work with low-power, VHF equipment over the BOCKSBERG-BERLIN path. The U. S. Army equipment was the ubiquitous AN/TRC-1 (70-100 MC, 50 watt, FM) equipment, normally rated to work 25 miles line-of-sight. Even with medium gain antennas, the 115 mile path was discouraging. (Please see Fig. 1.) This U. S. experimental circuit was notable in two respects. It was remarkably good in winter. It was remarkably dead in summer.

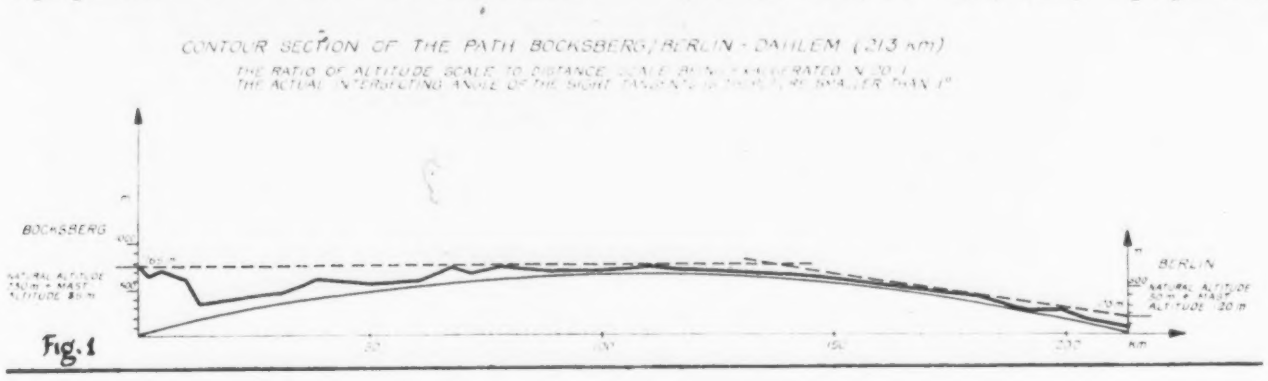


Fig. 1

By reason of the logistical factors involved, the U. S. Army had selected BOCKSBERG (elevation 2370 ft.), which is also in the Harz Mountains and which is in the near vicinity of BROCKEN.

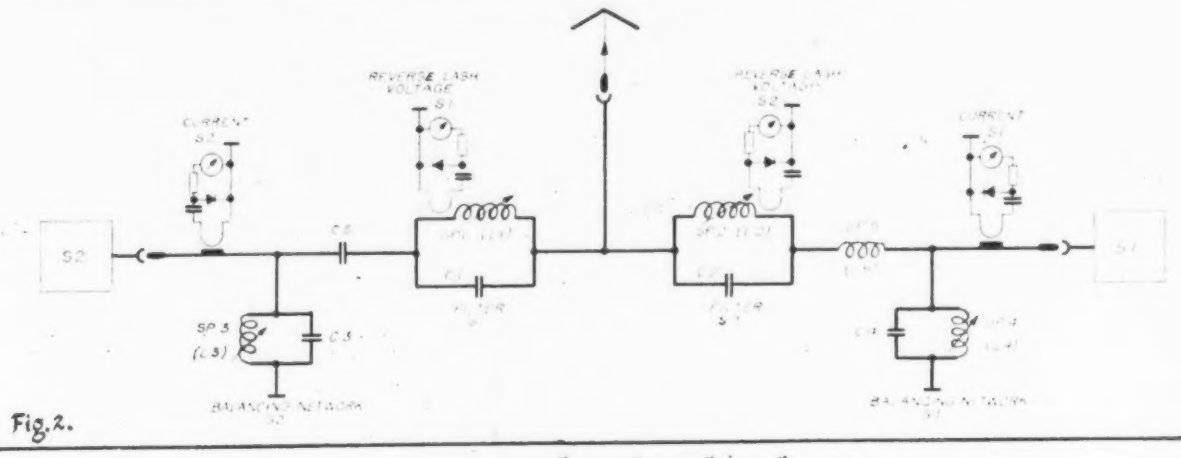


Fig. 2.

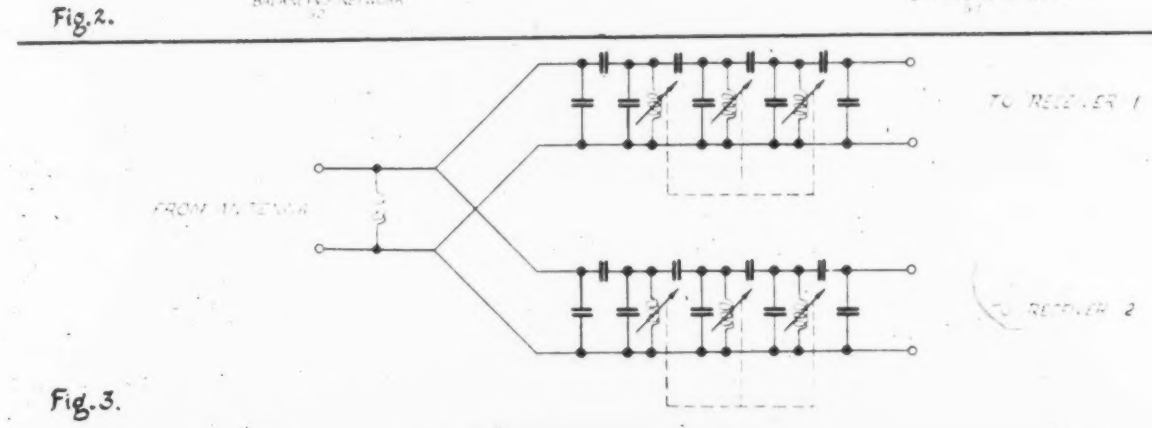
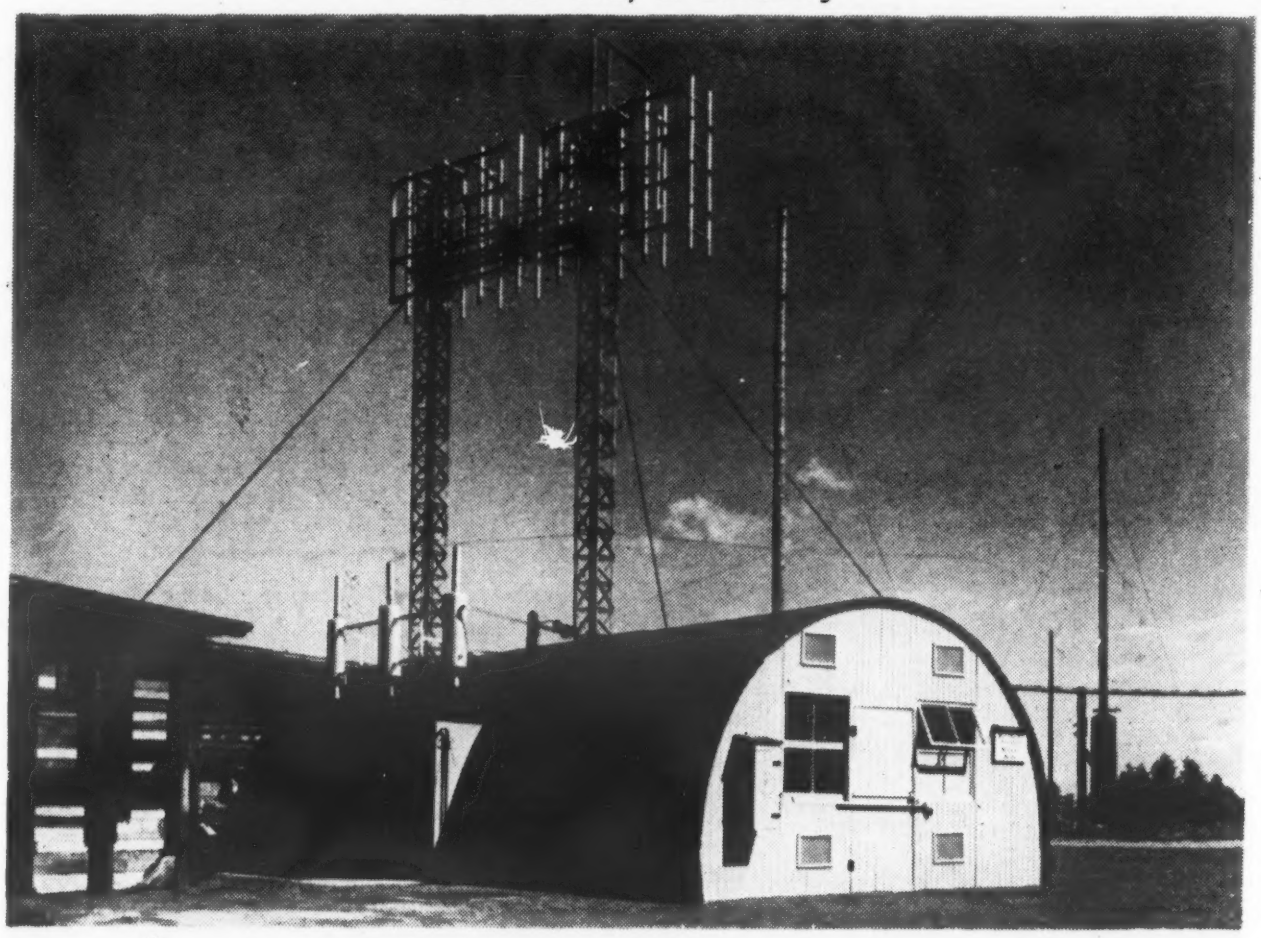


Fig. 3.

Receiver array at Bocksberg



Getting around to the intent of this article—during the winter of 1949-1950, the Signal Officer, Berlin Military Post,

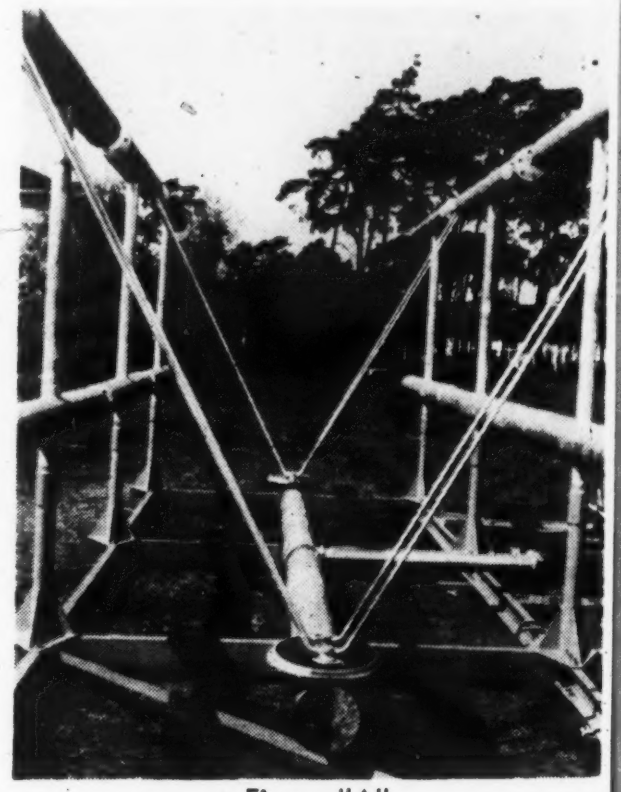
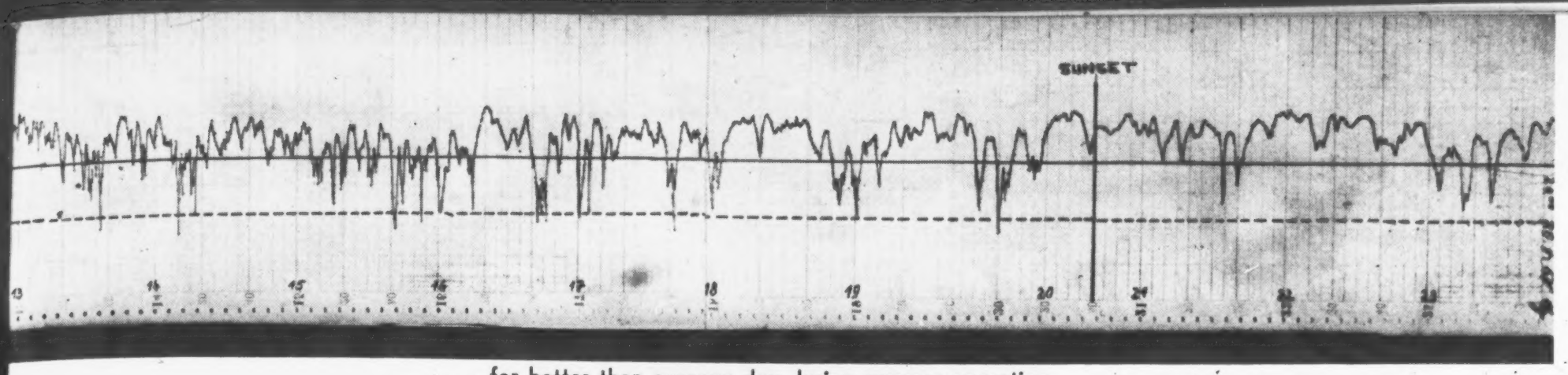


Figure "A"

Lt. Col. Archie S. Hoke, in conjunction with the firm of Siemens and Halske and with the approval of Major General Jerry V. Matejka, who was the Chief Signal Officer of the European Command at that time, installed a multi-channel radio link from Berlin to the West Zone.

The equipment does not contain any new or radical features but the unique usage of old principles is noteworthy. The use of broad-band dipoles, grounded at voltage-nodes, and voltage-fed is unique; at least to the author. The design of the channel-separation-filters also is interesting.

The West Zone terminal is located on Bocksberg, near Hahnnenklee, approximately 60 miles south and east of Hannover in the British Zone. Two 15-channel systems are provided. Channel Able transmits on 56.3 MC/s; channel Baker transmits on 64.4 MC/s.



. . . for better than average day during summer operation.

The outputs of both transmitters, at a 1.5 KW level, excite a single, high-gain array through a transmitting-separation-filter. The corresponding receiving-channels are in the 52 to 68 MC/s range and the receivers are fed from another single, high-gain antenna array through receiving channel-separation filters.

The audio channels (telephone circuits) converge to the Deutsche Post Exchange in Hannover. Thirty circuits, including two carrier engineering channels. are introduced into two, MG-15, carrier systems, resulting in two audio spectrums between 15 and 60 KC/s. The radio engineering channels fall within a 300 to 3,000 cycle per second spectrum.

The modulated output of each carrier is transmitted by a decimeter radio system (600 MC/s) from Hannover to Bocksberg. The circuits from Berlin are also carried from Bocksberg to Hannover by the same decimeter radio system.

The audio channels at Bocksberg are not demodulated but are transmitted between the VHF and decimeter equipments by coaxial cable.

Since the system was designed with antenna arrays elevated in excess of 300 feet at Berlin, economy dictated the use of channel-separation-filters and permitted the installation of both the transmitting and receiving arrays on the same tower.

The basic field of the antenna array is composed of eight broad-band dipoles with eight broad-band, parasitic reflectors. Each field may be excited, throughout the frequency range of 52-68 MC/s, through a 60-ohm transmission-line with a standing-wave ratio of less than 1.5/1; dipole elements are cylindrical with a length to diameter ratio of 9; the separation factor between dipoles and reflectors is 0.3 wavelengths; the power gain of each field is 24; the driven dipoles are voltage fed with 300-ohm parallel-tube transmission-lines. All elements are grounded at the center (the voltage node), bringing the entire array and tower to ground potential with respect to atmospheric influences. Fig. "A" shows some details of one field with the V feed lines and a combined, balancing and matching, tubular, line system.

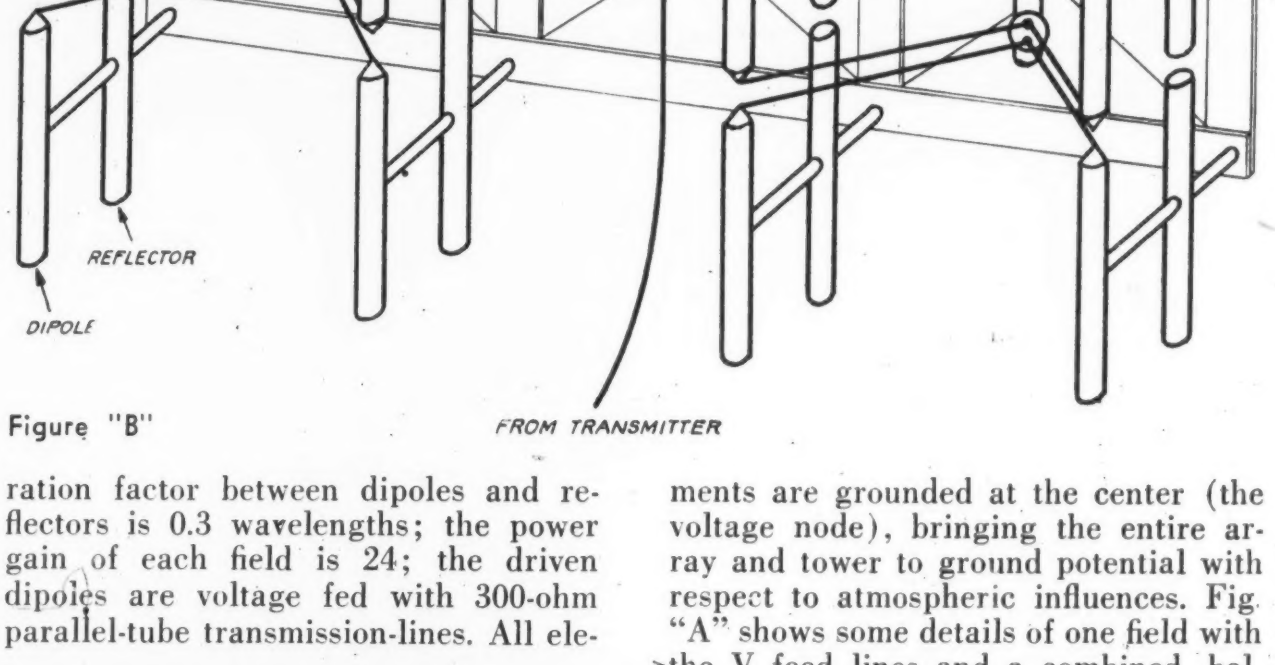


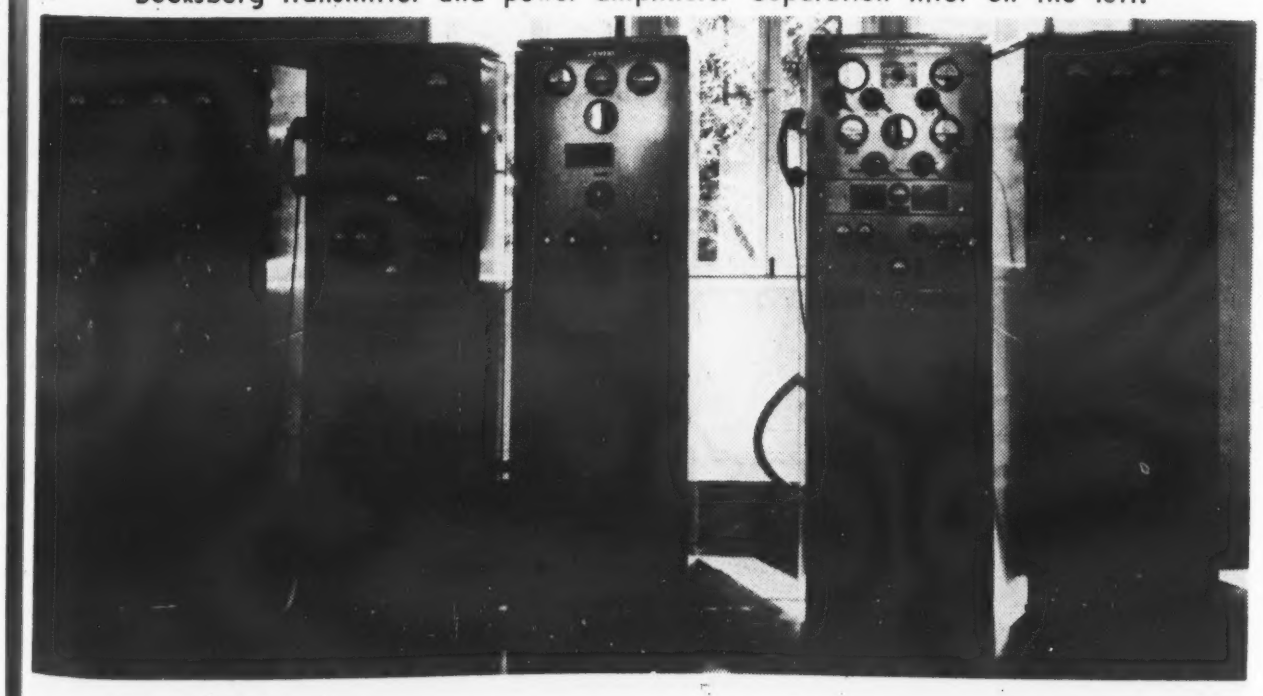
Figure "B"

The antennas of the system are compounded of the fields described above. At Berlin, two arrays are arranged on top of a 120 meter tower for the receivers. The power gain is approximately 50. The transmitting antenna, which is arranged beneath, consists of three arrays to compensate for the lower antenna height. The power gain is approximately 70. Antennas at Bocksberg are installed on 35 meter towers at the summit elevation of 726 meters. Fig. "B" shows details of the array which has the German nomenclature of a "Wassermann Antenna." The array is, obviously, an unidirectional antenna.

Fig. 2 shows details of the transmit-

(*Continued on page* 56, *col.* 3)

Bocksberg transmitter and power amplifiers. Separation filter on the left.



From the President

President Gary takes a look at the new year lying ahead, and after reviewing our objectives forecasts for us, "the greatest job we have ever faced." The coming months, he points out, will test our ability to succeed in a cooperative venture of high national importance.

In this opening letter of a new year which threatens to be as heavily fraught with problems and crises and plain hard work as any year in the history of our country, it seems fitting that we re-examine the basic purposes of our Association, so that in the months to follow we can keep them in mind in our daily work, and thus come as close as possible to fostering and fulfilling the objectives for which the AFCA was organized.

To do this, we may find it worth while to go back to first principles and re-read the following paragraphs, which appear in the preamble to the AFCA constitution:

> *"The Association endeavors to maintain and improve the cooperation between the Armed Forces and Industry in communications, and in the design, production, maintenance and operation of communications, electronics and photographic equipment in time of peace as well as in time of war.*
>
> *"The principal objective of the Association is an active membership of American citizens to whom the responsibility of training, production, maintenance and operation of this type of equipment falls in time of peace as well as in time of war."*

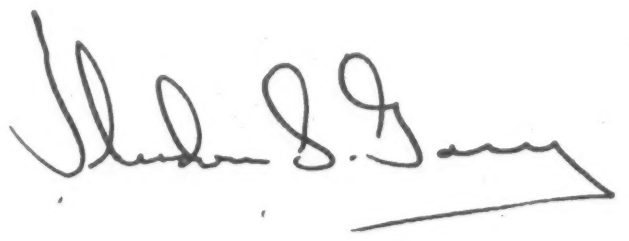
No doubt those objectives are clear enough to you, as they are to me. But a mere statement of objectives in cold type will not work. We need to expand them and put them to practial use.

We have in the AFCA a representative cross-section of U. S. citizens, both military and civilian, who, through their membership in our organization, have expressed their interest in doing every thing they can to improve cooperation between the armed services and industry, in the fields of communications, electronics, and photography. This implementation of interest may take any of a number of forms—through direct effort on the part of the individual; through the work of the AFCA staff; through the medium of contributions to SIGNAL; through the work of local chapters in their respective areas; and, probably most important of all, through the closest possible cooperation between each industrial organization and the various branches of the armed forces which it serves.

The turn of events in the international scene makes it imperative that we make the most of these opportunities to fulfill our obligations in the program of re-equipping our forces to meet the challenge that now confronts them.

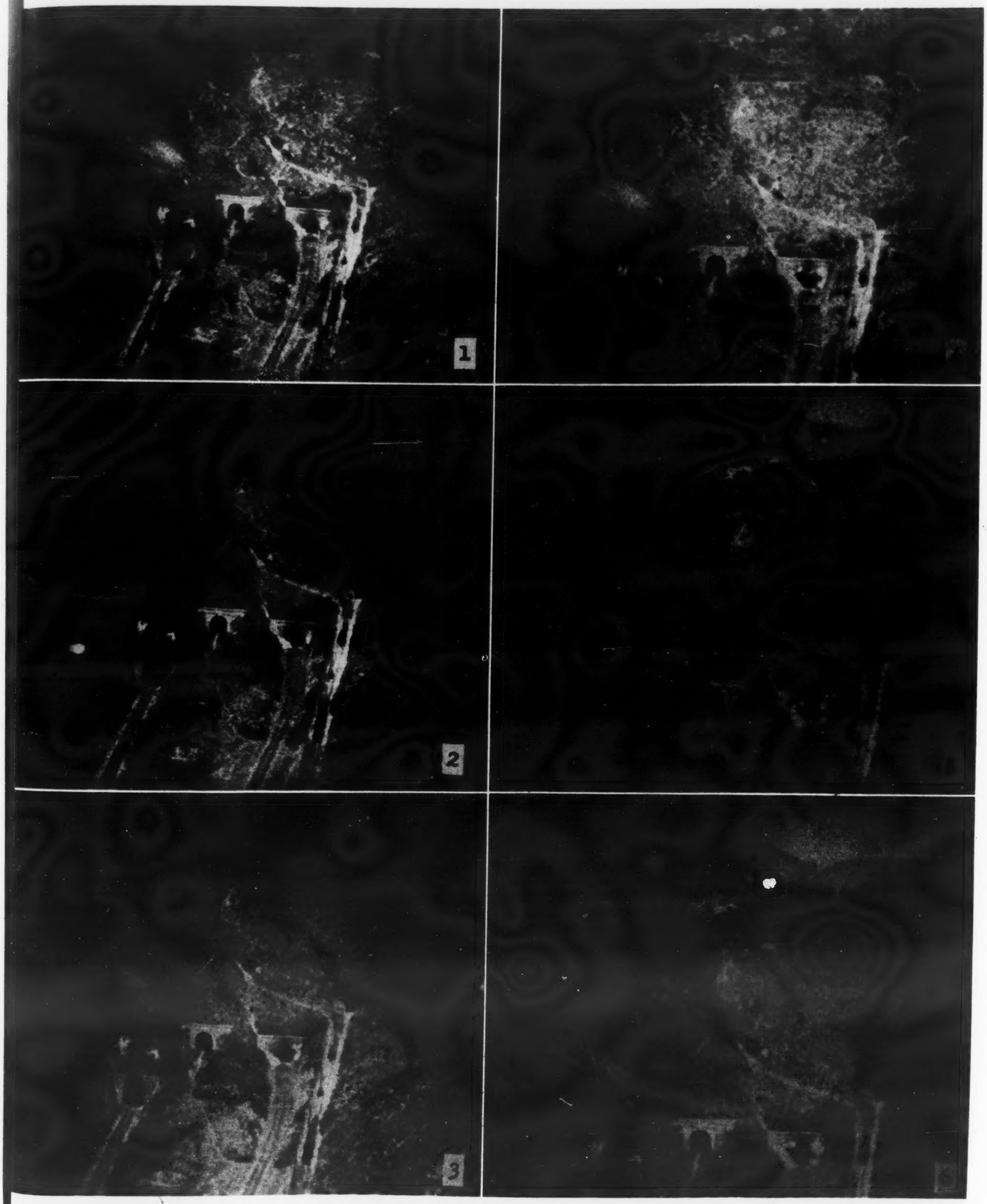
We have good reason to be proud of the past accomplishments of the AFCA. We have from time to time been of assistance to individuals, to industrial enterprises, and to the Services. We have brought home the importance of communications, electronics, and photography to many who, while using them to good advantage, have not always fully appreciated their scope of influence. The AFCA staff at Washington is ready, able and willing to continue their assistance in such matters on whatever scale the situation may demand.

The job ahead is the greatest we have ever faced, and the coming months a test of our ability to succeed in a cooperative venture of high national importance. I am confident that we will see it through, helping to insure for all people that which I most sincerely wish each and all of you—a New Year of increasing hope, success and happiness.



photos

Below: Gun camera records sequence of attack by U. S. Navy carrier based planes of VA-54 on North Korean train hidden in tunnel.



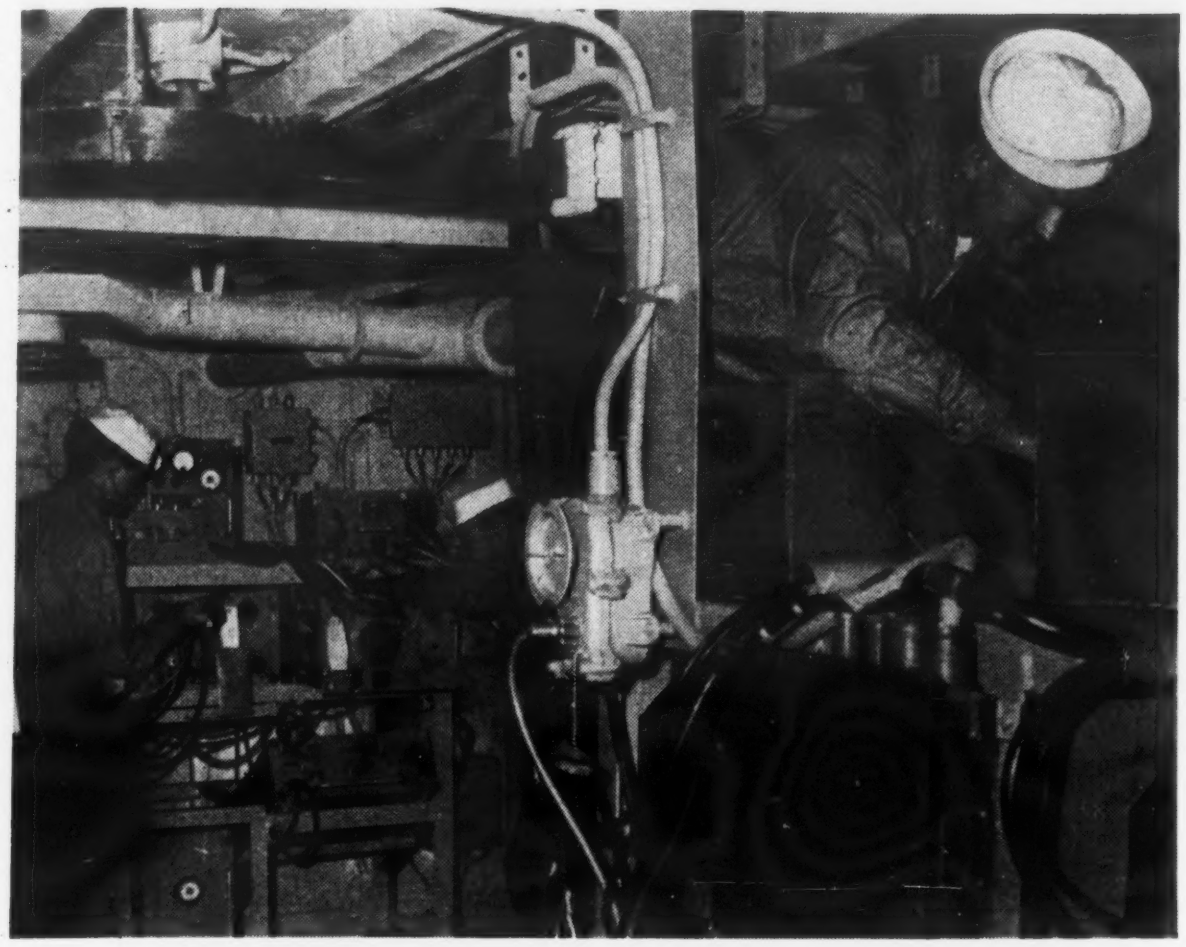
Television Aids Navy Reservists Training

Television training programs originating at the Television Laboratory of the Navy's Special Devices Center at Port Washington, L. I. are instructing Navy personnel within the N. Y. metropolitan area. Used as a training aid these programs do not substitute for previous types of instruction.

A Navy combat veteran explains the overall pattern of a typical amphibious landing to metropolitan N. Y. Naval reservists via TV. These instructional periods are broadcast weekly over WOR-TV.

Naval reserve enlisted men viewing program at Naval Reserve Training Center, Ft. Schuyler, during drill call series.

Navy's New Electronic Supply Ship, USS ELECTRON



With the commissioning of USS ELECTRON (AG 146), the Navy now has ample facilities to hand out push-buttons to the Pacific Fleet. The first United States Navy ship to be completely outfitted as an electronics supply and repair vessel in the present emergency, ELECTRON, formerly LST 1070, has reported for duty.

Wires, cables, tubes and stuff make the radar, radio equipment and repair shop aboard the Navy's first all electronics supply and repair ship which will service the Far Eastern fleet with some 30,000 separate items of equipment, and provide expert repair and maintenance for the electronics of the fleet's ships.

Modern advancements in electronics are vital to the Navy, resulting in the first all electronics supply and repair ship for duty with operating fleets. Here the shop of the ELECTRON, expertly equipped and staffed as shown.

ARMY PICTORIAL SERVICE—GERMANY

A demonstration of threading procedure is shown to students at USAREUR Central Film & Equipment Exchange, Friedburg, Germany.

Students learning operation course of 16mm projection equipment, projection course, USAREUR.

Somewhat hemmed in by reels of film is this corporal photographed in the film library USAREUR, Central Film and Equipment Exchange, Friedburg, Germany.

The Navy's Interest in LF and VLF Radio—Background For

The Giant Station At Jim Creek

By Rear Admiral John R. Redman, U. S. Navy
Director, Naval Communications

The development of high powered, low and very low frequency radio is somewhat unique to the Navy. This development has continued over a period of almost half a century. A brief description of the Navy's fundamental concept of communications will show why interest has been focused on that field.

The basic requirement which naval communications must satisfy is the ability to communicate with mobile forces at sea or in the air, wherever they may be. This requirement is satisfied by three elements of the Navy communications system:

First, the broadcast to ships at sea;

Second, ship-to-shore terminals at major stations, by which traffic from ships can enter the system;

And finally, the point-to-point circuits by which the major radio stations are linked.

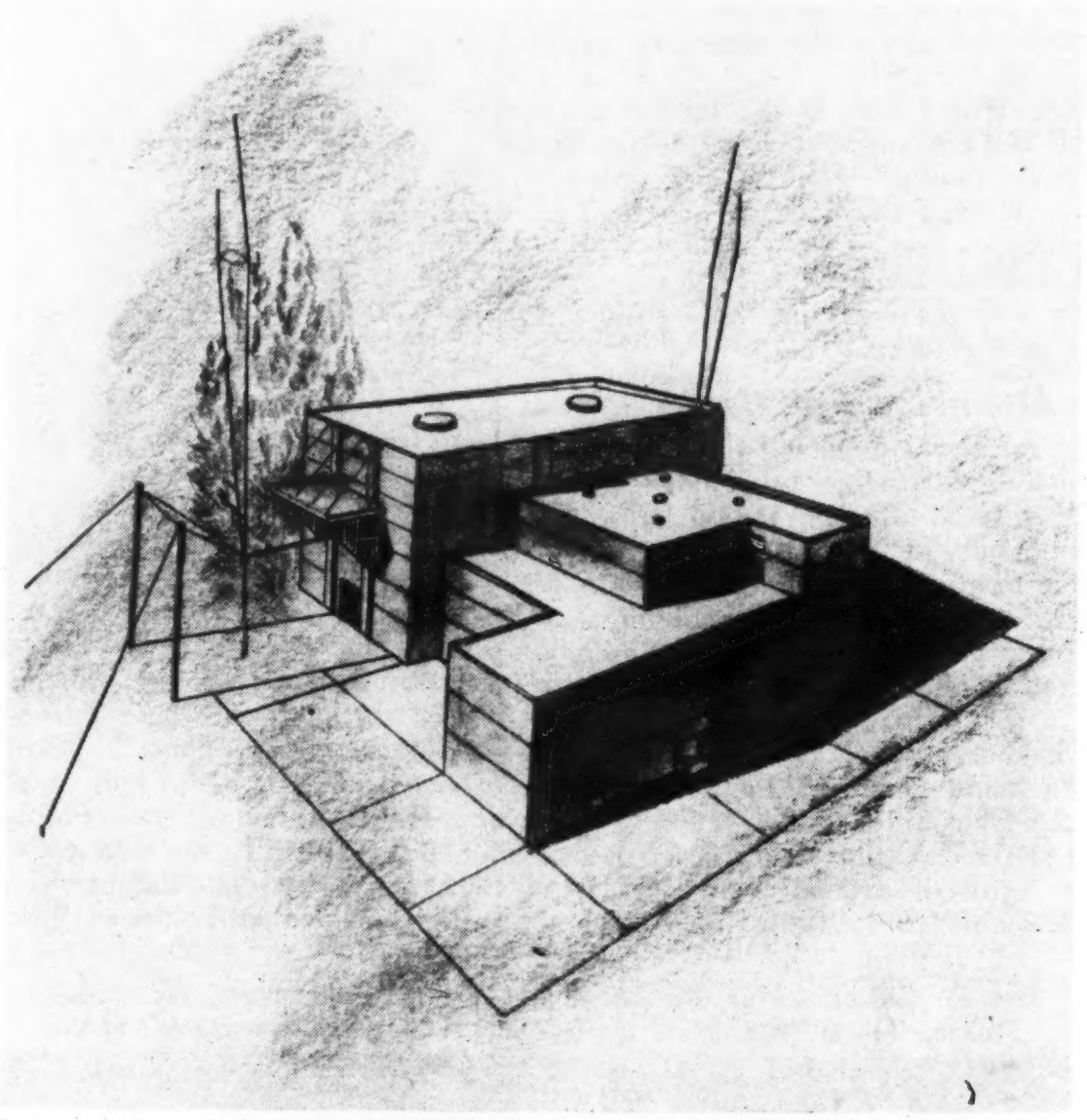
Very strong emphasis has been placed on broadcast methods because of the security afforded the mobile forces. This security results from the fact that the broadcasts deliver traffic to these forces without requiring them to use their transmitters. LF and VLF are particularly well suited for the broadcast method because of their non-directive characteristics, and freedom from fading and ionospheric disturbances.

LF Back in 1909

Recognition of the value of LF and VLF is not new to the Navy. In 1909 the Navy contracted for a 100 kilowatt, low-frequency transmitter for installation at Radio Arlington, Virginia. While the Arlington station was under construction, the Navy was engaged in the preparation of plans for its first chain of high power radio stations. Between 1913 and 1918 the Navy commissioned seven more low frequency stations with powers up to 350 kilowatts.

During World War I, the Navy also took over several commercial stations, including the Marconi station at Brunswick, N. J. It was from this station that President Wilson's "Fourteen Points" were transmitted to Germany.

In 1918, when the fighting in Europe was over, the United States found itself faced with a problem of maintaining contact with its occupation forces. It was for this purpose that an agreement was concluded with the French Government whereby the U. S. would construct a low frequency, high power radio station near Bordeaux. Radio Lafayette went into operation in August 1920 with a power of 1000 kilowatts.



Artist's conception of the transmitter building, central part of the Navy radio station at Jim Creek, Snohomish County, Washington.

All of the transmitters which have been mentioned thus far were of the spark, arc, or alternator type. In 1926 an 80 kilowatt vacuum tube transmitter was installed at San Diego by the Navy. This transmitter was still functioning very satisfactorily on thirty point six kilocycles when it was retired in 1949 in favor of one of its modern successors.

The success of the vacuum tube transmitter at San Diego encouraged replacement of arcs with more modern equipment. The first of a famous line of transmitters was constructed by the General Electric Company and installed at Cavite in 1932. The voice of Radio Cavite was heard all over the world until the station was destroyed by the Japanese in December 1941. Three similar transmitters were installed in rapid succession at

Pearl Harbor
Canal Zone
Annapolis

The Pearl Harbor station was later moved to an isolated location at LUALUALEI and the power increased to 500 kilowatts.

Two incidents will serve to illustrate the problems involved in high power radio installations. When the radio transmitter was still at Pearl Harbor,

TRANSMITTER FOR U. S. NAVY RCA

100 KW LVF transmitter built for U.S. Navy

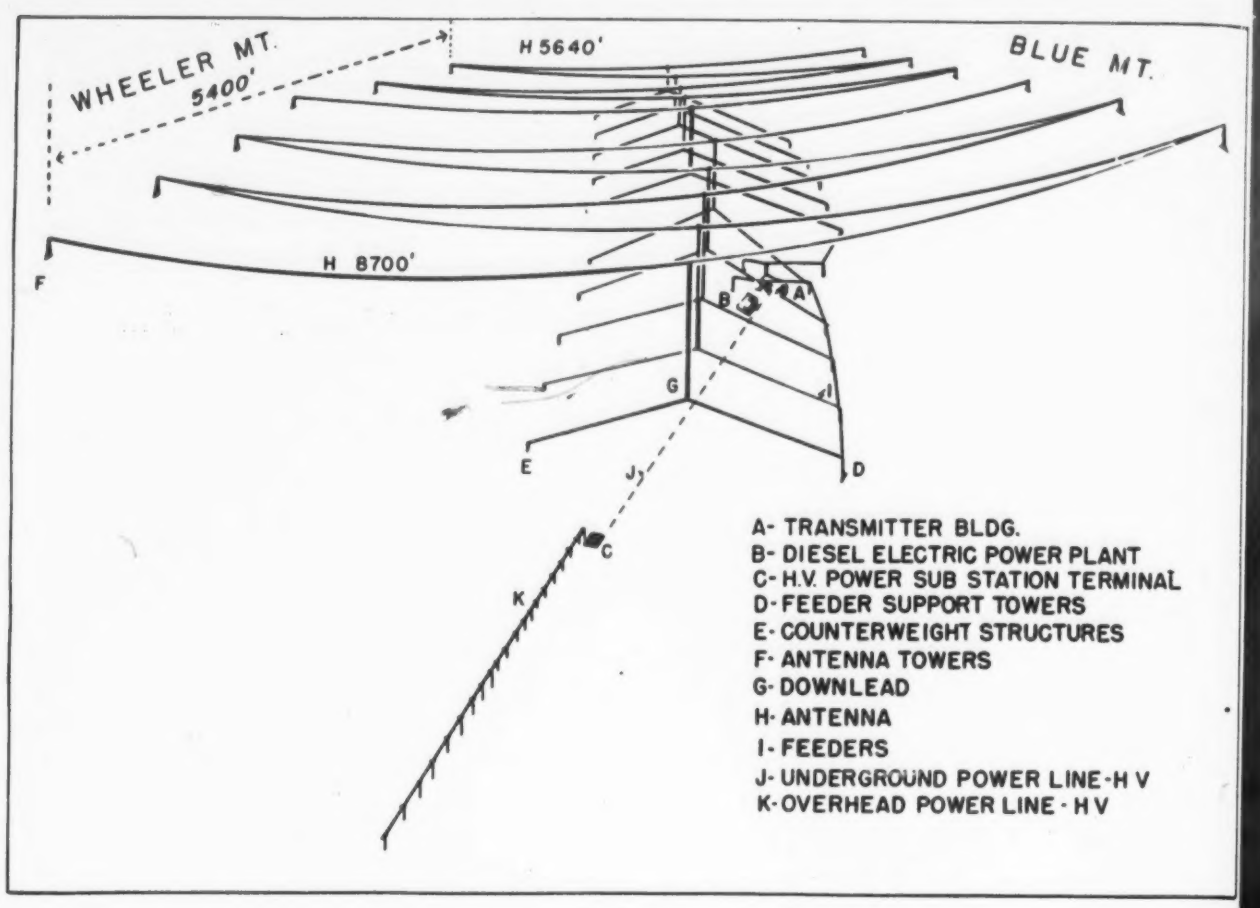
a tool shed was located in the vicinity of the antenna towers. Sufficient heat was generated in the nails of this shed by induced currents to set the shed on fire. When the transmitter was moved to LUALUALEI, a reinforced concrete building was used as a helix house. Sufficient current was induced in the reinforcing rods of this building to melt the steel and cause the structure to partially disintegrate.

During World War II the station at LUALUALEI was operated at full power for more than twenty-one consecutive months. During this time it averaged more than 23 hours and 50 minutes of actual transmission per day. The manufacturer and the Navy are both proud of this performance.

Alternators Still Used

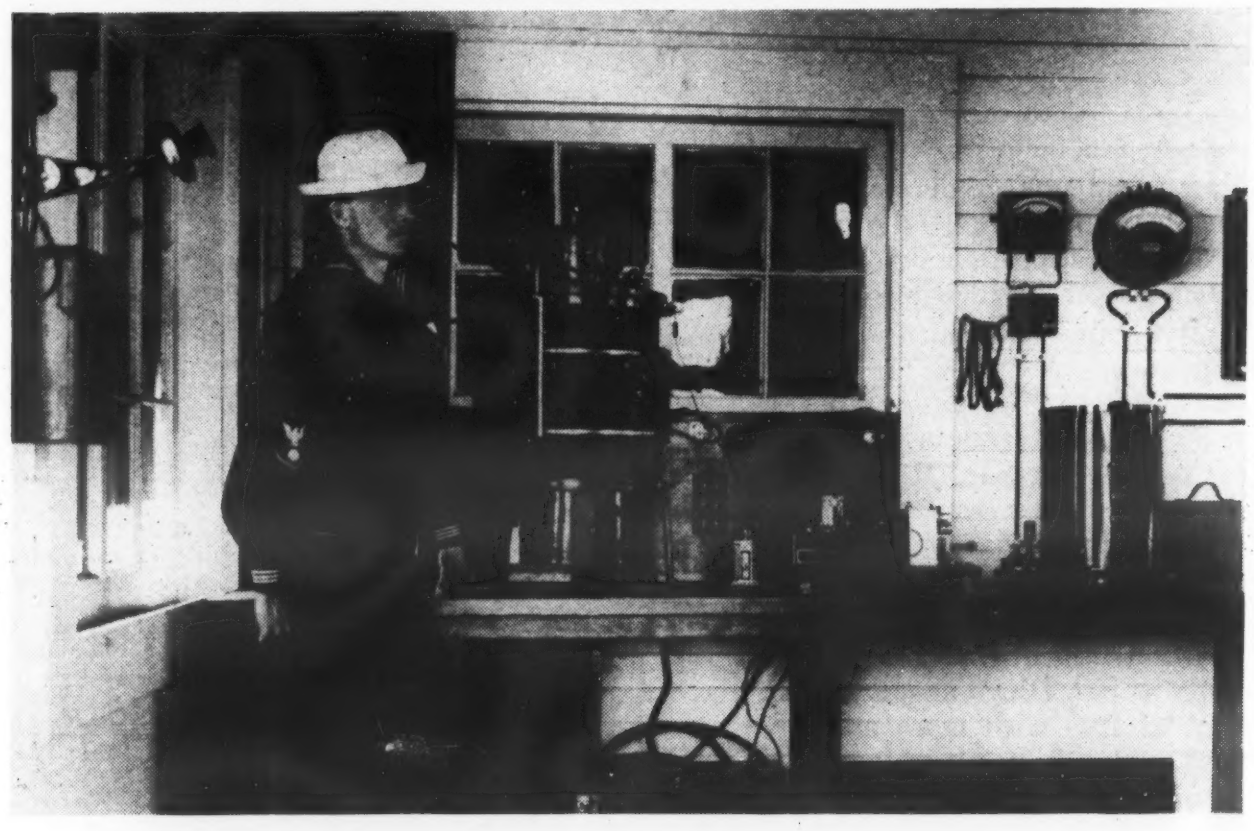
Although development of the vacuum tube made it possible to replace the spark, arc and alternator type transmitters, some of the alternators still continue to give excellent service. During World War II the Navy obtained two of the alternators from the Radio Corporation of America. Both of these were installed in HAIKU Valley, on the island of Oahu, to augment the services being rendered by the LUALUALEI transmitter.

The HAIKU Valley site was selected as the result of extensive surveys. It was desirable to locate a site which would eliminate the need for large steel towers. Because of the wartime demands for steel for other purposes, it would have been almost impossible to procure enough steel to build such towers. HAIKU filled all the requirements. When the installation was completed, there was a very fine catenary antenna system suspended between two mountain peaks. This system consists of four separate catenary strands. Each is more than seven thousand feet long. The downleads from these strands drop more than 1300 feet to the transmitter building in the valley below. The HAIKU alternator, although already a veteran was more than gratifying in its new job of working for Uncle Sam's fighting machine.



Line sketch of Radio Station, Jim Creek, Wash.

Below: Interior view of one of the operating buildings of the Naval radio station, Mare Island, Cal. in 1904. Note old-fashioned meters and other equipment.

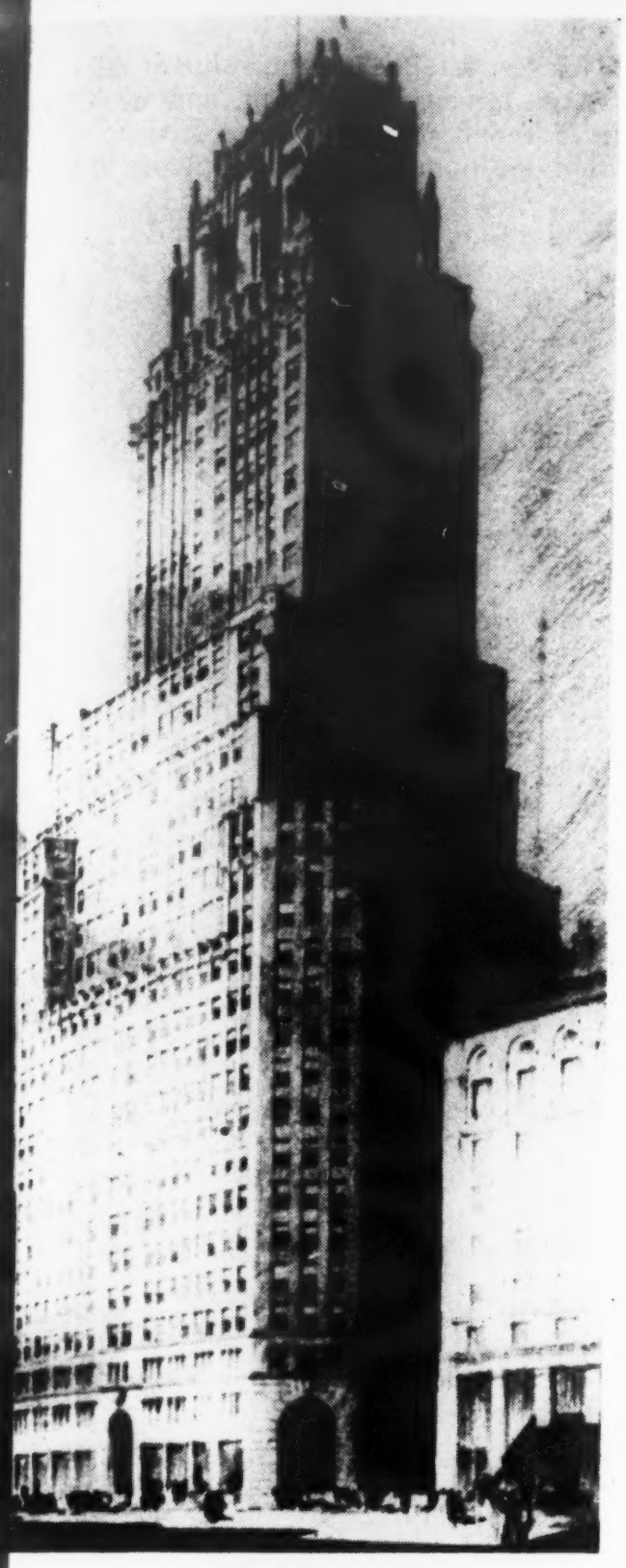


To cover the entire evolution of LF and VLF radio in the Navy would require much more space than is available in this article. Therefore, only a few of the better known highlights have been touched upon here. In any event, anything that might be said about LF and VLF radio is another compliment to the entire American communications industry. LF and VLF radio continues to play a very important part in the Navy's world-wide communication requirements. For this reason, the Navy is now constructing the greatest of them all.

The "Jim Creek" Station

A site for a high power VLF station has been selected at Jim Creek, approximately eleven miles from Arlington, Washington. Thus the Navy will have another "Radio Arlington," separated from the original Radio Arlington by thousands of miles and a half century

(*Continued on page* 58, *col.* 3)



"67 Broad"

Above: The building at the address familiar to all IT&T men, 67 Broad Street, New York City—the company headquarters.

The IT&T

World wide system of the International Telephone and Telegraph Corporation

Operation — Manufacture

Research — Development

Distribution — Technical Service

The search for new and improved means of communication has preoccupied and intrigued man since the beginning of time. A never-ending challenge, it has produced an almost infinite variety of devices, from the smoke spiral and "talking drum" of primitive man to the highly complex electronic wonders of the present century.

Here in the United States, the search for faster and more reliable communications has given rise to a multi-billion dollar industry, numbering well over 1,200 companies and capable of supplying everything from a radio tube to a fully equipped TV broadcasting studio.

One of the largest and perhaps most versatile of these companies is the International Telephone and Telegraph Corporation, an American-owned telecommunication and electronics enterprise with offices at 67 Broad Street, New York. Since its formation in 1920, this company has built a worldwide communications system which embraces not only research, development and manufacture, but sale, installation, operation and technical services as well.

As a combined international communications and manufacturing entity, IT&T is unique: it is one of the few companies in the world that can offer anything from scientists, technicians and managers to automatic switchboards, antennae and complete telephone exchanges. So vast is its experience in the international communications field that foreign governments frequently call upon it for technical assistance in the expansion and modernization of their communication systems.

IT&T domain encompasses the six continents, the two principal oceans, a number of seas and a considerable portion of the atmosphere.

Through its associated companies, IT&T can draw upon experience as old as the electrical communication industry itself. Two of its cable and radiotelegraph operating companies, All America Cables and Radio, Inc., and The Commercial Cable Company, date from 1878 and 1883, respectively. Its oldest factory is Bell Telephone Manufacturing Company, founded in Antwerp, Belgium, in 1882, only six years after the invention of the telephone. Its largest factory, Standard Telephones and Cables, Ltd., which is also the largest producer of electronic equipment in the British Empire, was founded in London only one year later, in 1883. IT&T's manufacturing affiliates in the United States — Federal Telephone and Radio Corporation (Clifton, N. J.) and the Capehart-Farnsworth Corporation (Fort Wayne, Ind.)—are recognized pioneers in the field of radio and television.

To carry out its varied activities, IT&T maintains 32 factories in 21 countries, 250 sales outlets, a separate trading corporation to encourage imports, three laboratory companies, 12 telephone operating companies and a cable and radiotelegraph network joining the United States with every country in the world. It also has three marine radio companies that design, install and operate shipboard communication equipment; a network of nine shore stations for communicating with ships at sea, and service stations and agencies at 157 of the world's great seaports.

Manufacture

IT&T factories employ over 50,000 men and women and produce equipment that may be classified roughly as follows: automatic switching and signalling, wire communication, subscriber equipment, radio communication, radio and television broadcasting and receiving, industrial television, mobile communication, radio aids to navigation, automatic reservations, remote indication, components, and consumer goods.

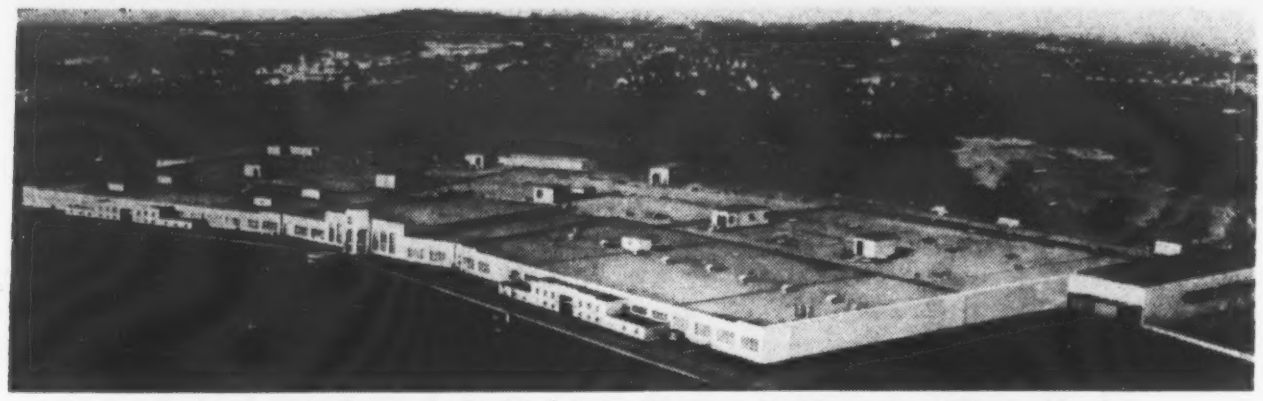
Automatic Switching

IT&T factories produce five systems of automatic telephone switching equipment, including several types of Rotary, Step-by-Step, Relay, Swedish Crossbar, and Universal.

Rotary equipment is a System development, and is manufactured by IT&T factories in Belgium, Denmark, France, Italy, Norway, Spain, and the United States. More than 3,000,000 lines of Rotary have been installed or are on order for 31 operating organizations and telephone administrations, including seven European capitals. Step-by-Step equipment is manufactured or assembled by IT&T factories in ten countries, including the United States. More than a million lines of this equipment have been installed in Argentina, Australia, Chile, Eire, France, Germany, Great Britain, India, North Africa, and the United States.

However, experience in automatic switching within the IT&T System is not confined to the manufacture of central office equipment. National networks such as those of Romania and Spain, and metropolitan networks such as those in Brussels, The Hague, and Paris, were designed, built, installed, and, in the case of Romania and Spain, operated by System companies.

IT&T companies have taken a lead-



Federal Telephone & Radio Corp. factory building in Clifton, N. J.

ing part in extending the range of subscriber dialing. In December, 1936, a new System of automatic toll-ticketing, whereby time and distance charges for long-distance calls were automatically recorded, was placed in public service in Bruges, Belgium. Considerable progress towards achieving a completely automatic national telephone system was made in Belgium, Holland, and Switzerland before 1939. IT&T is now actively engaged in tests that will contribute largely to determining the toll-signalling arrangements that will be used in operator-to-subscriber dialing on an international scale in Europe and other parts of the World.

Wire Communications

IT&T factories have been actively engaged in research, development, and manufacture of telephone cable and associated equipment for nearly 40 years. Associated companies in this field are located in Argentina, Great Britain, Norway, Spain, and the United States.

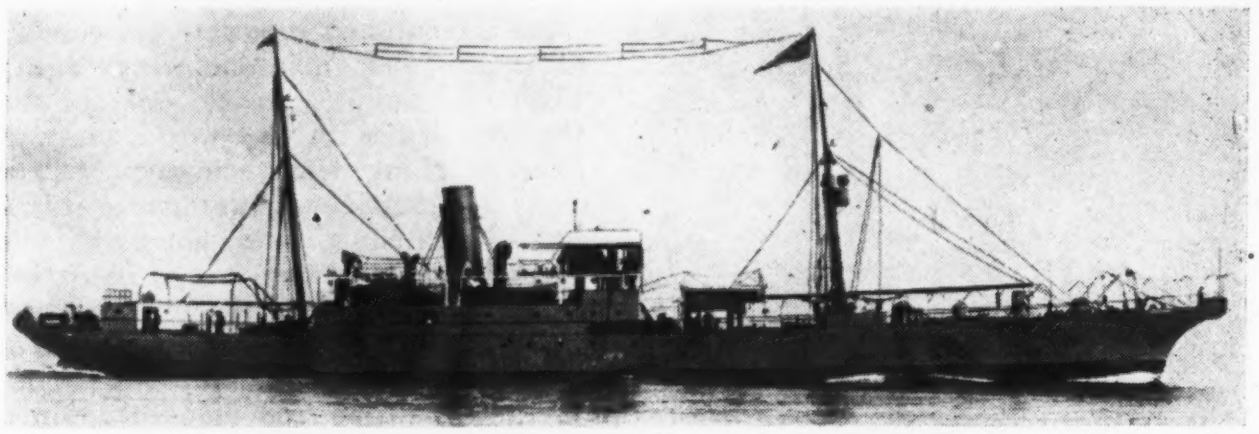
IT&T's equipment and techniques in the wire communication field are of such recognized merit that more than 20 independent companies, engaged in the manufacture of telephone cable, have signed contracts providing not only for licenses but, also, for the dissemination of information on designs, machines, processes, raw materials, and all other technical information essential to the most effective use of the licenses.

Subscriber Equipment

The design and manufacture of telephone subsets, private branch exchanges, and teleprinters are important activities within the IT&T System. Subsets are manufactured by all but a few specialized factories, branch exchanges by 15, and teleprinters by two. As in the case of IT&T central office equipment, its branch exchanges are used by System and non-System operating companies alike. More than 50,000 IT&T Creed teleprinters have been installed in 66 different countries and territories, under every conceivable operating condition.

Radio Communication

IT&T has been particularly active in the field of radio communication. One of its associates in the United States pioneered the Poulsen-Pedersen arc method of transmission in commercial telegraphy on land, and from shore to ships at sea, before World War I. Between the two World Wars, associated companies in Europe participated in establishing the first trans-Atlantic radiotelephone circuit and commercial radiotelephone service to ocean-going vessels. IT&T likewise has played an active part in the evolution of radiotelephone installations from the carrier, double-sideband type to the multichannel, single-sideband type. Its installation aboard the *R.M.S. Caronia* marked the first occasion that single-sideband radiotelephony was available to a passenger liner. System operating companies today maintain over 50 radiotelephone



"All America" cable ship, one of three which service the 47,000 mile undersea cable network of the IT&T Corp.

circuits between stations on land; many of these circuits are of the single-sideband type. The System also operates nearly 100 radiotelegraph circuits, both national and international, in addition to shore stations in the United States, Hawaii, and Puerto Rico, for communication with ships at sea. Such practical operating experience underlies IT&T research, development, and manufacture in the field of radio communication.

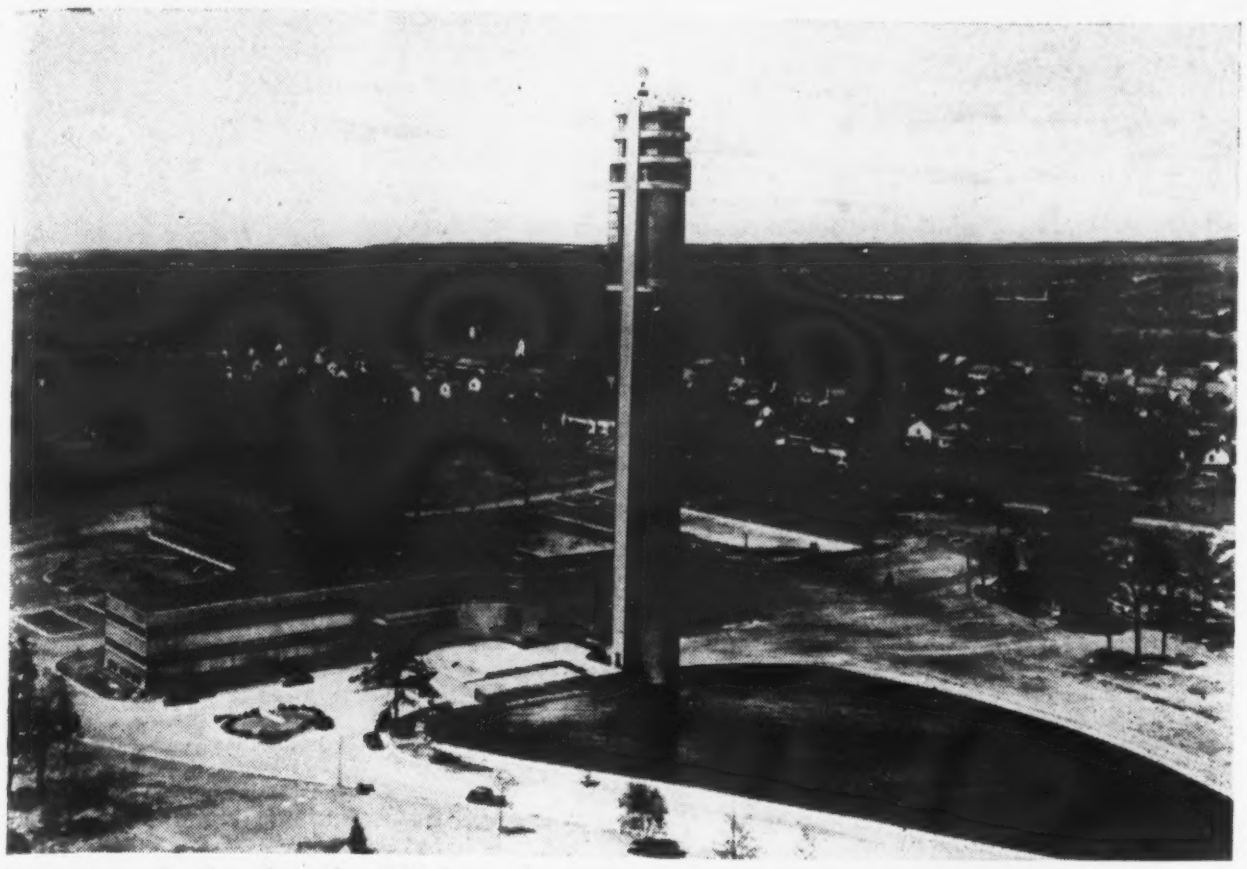
IT&T companies were the first to demonstrate radiotelephony by microwave, in a test conducted across the English Channel on March 31, 1931. This test established the value of micro waves for communication, and was the forerunner of modern beamed television, multichannel radiotelephone links, and multiplex transmission by PTM (pulse-time modulation) and PCM (pulse-code modulation), in which developments IT&T has also led the way.

The first PTM microwave link to be placed in commercial service in North America was installed by an IT&T associate, Federal Telecommunication Laboratories, in November 1948, for the Maritime Telephone and Telegraph Company. The link, which connects Prince Edward Island and the mainland of Nova Scotia, is being used to transmit radio programs across the Northumberland Strait. Radio links employing pulse time modulation have been manufactured, installed or supplied by IT&T associates in France, Great Britain, and the United States. An extensive microwave communication system, covering almost 200 miles of power lines, is presently being installed for the Booneville Power Administration in the state of Washington. Other users of this equipment include pipelines, public utilities, airports, government agencies and military establishments.

Broadcasting

IT&T installed the fifth oldest broadcasting station in the world—Station WKAQ, San Juan, Puerto Rico — in 1922, and was in charge of its operation continuously until November, 1949. In 1937, IT&T designed and installed atop the Eiffel Tower, in Paris, what was then the world's most powerful tele-

Capehart-Farnsworth plant at Fort Wayne, Indiana.



Laboratory in the sky—the 200 foot aluminum covered tower and laboratoryy building of the Federal Telecommunications Laboratories, IT&T's research unit at Nutley, N. J.

vision transmitter (30 kw). IT&T companies have built some of the largest AM stations now operating on medium and short waves in Europe, America, and Australia.

In Great Britain, IT&T's factory has manufactured most of the radio equipment for the British Broadcasting Corporation; transmitters for one of the largest shortwave stations in the world, at Skelton, near Carlisle; most of the 121 transmitters used by the "Voice of Britain"; and, during World War II, 60 emergency stations.

IT&T's factory in Belgium developed and installed in 1938 one of the most complete and modern radio broadcasting centers in the world—the Brussels station of the Belgian National Broadcasting Institute. This center includes 17 studios, five recording and reproducing cubicles, and two giant mixing desks which control the broadcasting of all programs.

In Australia, IT&T's manufacturing subsidiary has supplied radio transmitters for nearly all the stations of the Australian Broadcasting Commission, as well as those for many commercial, "B" class stations. Altogether, three-quarters of the total radio power broadcast in Australia is produced by IT&T transmitters.

Other outstanding IT&T-built transmitters outside the United States include headquarters for Argentina's largest radio broadcasting network, R. A. D. E. S., and stations in Copenhagen, Prague, and Rome.

IT&T's manufacturing subsidiary in the United States, Federal Telephone and Radio Corporation, designed and built the new transmitter equipment installed by WCBS, key station of the Columbia Broadcasting Company, in 1941. During the war, Federal supplied equipment for "Voice of America" stations on the West Coast and in Cincinnati, including the most powerful high-frequency transmitters in the world. In 1945, in collaboration with the Columbia Broadcasting Company, this IT&T subsidiary demonstrated what is generally acknowledged to be one of the most successful systems of color television yet developed.

Modern, air-cooled television transmitters and ultra-high frequency radio links developed by Federal Telecommunication Laboratories, and employing the latest techniques in studio-to-transmitter, inter-city relay and portable mobile remote pickup transmission of television programs, are being manufactured and installed for leading TV broadcasters throughout the United States. One of the largest inter-city television microwave links to be owned and operated by a broadcaster is presently being supplied by Federal Telecommunication Laboratories to WSM-TV, Nashville, Tenn. The link will connect Nashville with Louisville, Kentucky, a distance of 163 miles.

Ultra-high frequency links now in production include a specially designed system which relays the video or picture portion of the program and the newly developed "Sound Diplexing" system, which permits the transmission of sound, as well as picture, over a single television relay system. A notable advance in television broadcasting, the Sound Diplexing unit has been installed for the first time by Station WKZO's new TV studios in Kalamazoo, Michigan.

Broadcast receivers are manufactured or assembled by IT&T factories in the United States, Australia, Belgium, Brazil, Chile, France, Germany, Great Britain and Norway. Television receivers were in commercial production more than a decade ago by IT&T factories in France and Great Britain, and Kolster-Brandes 12-inch-tube set is among the leading home receivers in the latter country, today. Radiophonographs with manual or automatic record changers are being produced by IT&T factories in Australia, Austria, Belgium, France, Germany, and Great Britain. In the United States, the Capehart-Farnsworth Corporation, IT&T's manufacturing associate at Fort Wayne, Indiana, is manufacturing a complete line of radio-phonograph and television instruments. The line includes the newly developed rectangular picture tubes, incorporating the most advanced techniques in TV circuit and tube construction. Additional refinements are contemplated, and new models are being placed on the market through the revitalized and augmented Capehart national distribution organization.

Industrial Television

IT&T has been active in the industrial television field since May, 1949, when it acquired the Capehart-Farnsworth Corporation. A line of industrial television equipment is now in production at the Fort Wayne plant and is being marketed in the United States under the trade name, "Utiliscope." This equipment, which utilizes a television camera and viewing screen, has wide industrial application, including the inspection of materials and the observation of processes in atomic power plants and locations where it is impossible or impractical to station a human observer.

Mobile Communication

Mobile radio equipment for communication between points on land, or between ground and air, is manufactured or assembled by IT&T factories in Argentina, Australia, Canada, France, Great Britain, Italy, Sweden, and the United States.

The mobile communications division

A portion of the rows of finder and selector switch bays in the Federal Rotary Dial Switching equipment installed at the Lexington (Ky.) Telephone Co.

of the Capehart-Farnsworth Corporation, a pioneer in the development of very-high-frequency railway radiotelephone and passenger entertainment systems, specializes in equipment which permits instantaneous communication between train personnel, between two or more trains, between trains and stations, between two or more stations and between train personnel and crewmen who may be working nearby (via walkie-talkie). One of the most recent and extensive installations of this type was demonstrated in June, 1950, with the completion by the Erie Railroad of an 884-mile radiotelephone communications system extending from Jersey City, New Jersey, to Marion, Ohio. This four-way train radio system, the most comprehensive main-line installation on any railroad in the world, was supplied by the Capehart-Farnsworth Corporation.

The problem of designing telecommunication equipment for international use by aircraft is especially complex, because of the trend to multi-channel equipment operated by push-buttons, which requires exceptional accuracy alike from the airborne station and all ground stations along its route. IT&T factories in France, Great Britain, and the United States produce equipment designed to meet the national and international problems involved.

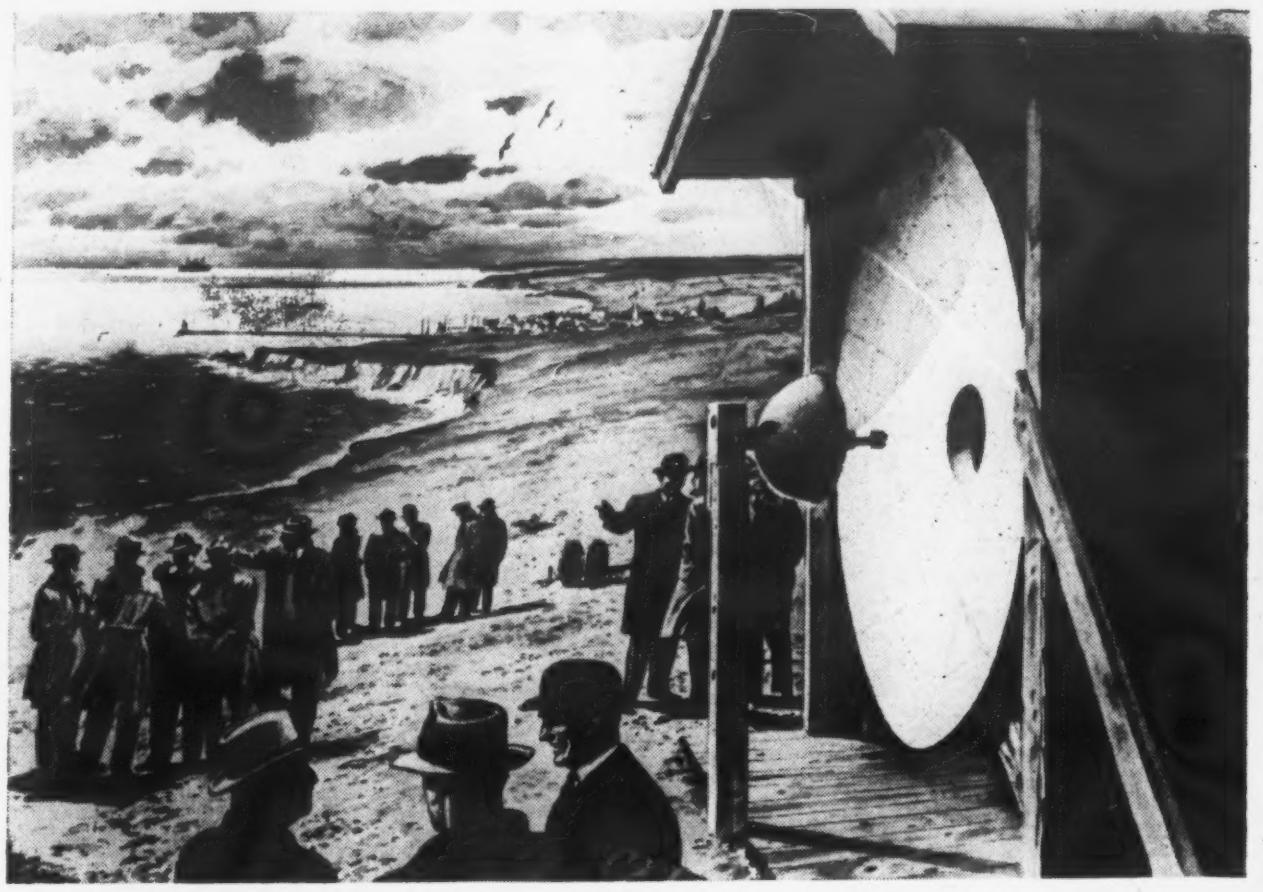
Radio Aids to Navigation

IT&T is the recognized pioneer of radio aids to marine and aerial navigation, having adapted the Kolster Radio Compass for shipboard use in 1921, pioneered the instantaneous direction-finder in 1935, and developed the system of landing airplanes by instrument used in four major countries before World War II. The instrument landing system developed by IT&T in the United States during World War II has become the basis of a system standardized by the International Civil Aviation Organization for international use. The wartime system and its subsequent modifications are now in use in 25 different countries. Complete postwar instrument landing systems, manufactured by Federal, have been ordered by or delivered to Argentina, Belgium, Canada, Denmark, Eire, France, Holland, Norway, Portugal, and Switzerland.

Like instrument landing equipment, the radio direction finder has been the subject of intense research by IT&T scientists in both hemispheres. In France, a new type of fully automatic radio compass, with 360-degree indication, was developed for use in airplanes, successfully tested in a flight from Paris to the Isle of Reunion, off the coast of Madagascar, in 1935, and introduced to the United States by IT&T in 1937. The Paris laboratories also developed a ground-based direction finder of improved design, and made available in 1939 an airport direction finder operating on very high frequency.

During World War II, 25 different types of direction-finding equipment employing cathode-ray-tube indication were made available to the armed forces by IT&T laboratories. The U. S. Navy procured a large number of fixed, shore-type direction finders and others for shipboard use. The HF/DF type, known as "Huff-Duff," proved an effective weapon in combatting enemy submarines.

Since the end of World War II, a part of IT&T's domestic activity has been devoted to projects for the U. S. Armed Forces, designed to improve existing systems. In 1948, a contract for the development and manufacture of long range navigation equipment was awarded to Federal by the United States Government. Similar collaboration between the Government and IT&T's domestic research unit, Federal Telecommunication Laboratories, Inc., has yielded several new developments, including 2-color radar, DME (distance measuring equipment) and altitude coding. The improved radar system, which plots the course of an airplane as a moving green dot on an amber screen, is designed primarily to facilitate plane identification. DME—a combination of ground and airborne radar equipment—provides the pilot with a constant and accurate measurement of distances from his plane to fixed ground beacons, while altitude coding permits increased accuracy in air traffic control.



On March 31, 1931, IT&T associates in England and France collaborated in the demonstration of the first micro-wave circuit across the English Channel between Calais and Dover. Using directional reflectors and only half a watt of power, this test established the value of microwaves for communications.

DC-3 owned and operated by Federal Telecommunications Laboratories is used to test new IT&T developed aerial navigation and traffic control devices.

Automatic Reservations

In answer to the need for increased speed and efficiency in the handling of space reservations, IT&T companies have developed the *INTELEX* system—a unique combination of electronic devices which can process the most complicated request for space with the accuracy of machinery and speed of electricity. The system, introduced to the public in May, 1948, was recently adapted to railroad reservations, and successfully demonstrated to the press in New York, in June, 1950, by the Pennsylvania Railroad. Designed for airlines as well as railways, the system can also be applied to meet the requirements of hotels, steamship lines, theatres and bus lines, or any other business in which the reservation of space is a problem.

Research and Development

To facilitate its extensive research program, IT&T maintains three operating laboratory companies—the Federal Telecommunication Laboratories, Inc., in Nutley, N. J.; Standard Telecommunication Laboratories, Limited, in Lon-

(*Continued on page* 56, *col.* 3)

U. S. NAVAL TRAINING CENTER GREAT LAKES, ILLINOIS

By Chief Machinist's-Mate R. M. McKenna, USN

Electronics Technicians School at the U. S. Naval Training Center, Great Lakes, Ill., is at present sending graduates to the forces afloat every two weeks. It is one of two such schools in the Navy, the other being on Treasure Island in San Francisco Bay, and it turns out roughly half of the Navy's electronics repairmen.

Ten years ago Navy radiomen were expected to repair their own equipment. In July 1941 selected radiomen with special training in materiel (repair) work were designated as radio technicians. When sonar, radar and loran equipment entered the Navy picture, these ratings took over their maintenance and repair as well. The change of name to electronics technician (ET), in 1945, was a belated recognition of the fact that these men were working in a much wider field than radio.

The latest addition to the ET's bag of tricks, dating from April 1949, is the calibration and repair of Geiger counters and other radioactivity detectors and measuring instruments.

ET's Elite of Technicians

A total of nine Navy ratings are required to operate all of the electronic equipment used in the Navy. The ET is required to be able to repair and adjust all of this equipment and, in effect, to serve as a trouble-shooter for all nine ratings. As a result, the operators need not be more than superficially trained in repair or theory fundamentals, making their mass procurement easier and their training period shorter.

The same factors make the procurement and training of the ET the more difficult. By general agreement among enlisted men the ET's constitute an intellectual elite among the Navy's technicans, and their procurement and training contribute heavily to the support of that opinion.

Prospective students must have a combined GCT-ARI score of 120 and a mechanical aptitude score of 60 or above. They must be volunteers, evincing a real desire to attend the school despite the warning that, by general consensus, it is the most difficult class A school in the Navy.

Eighty-five percent of the students come to the school directly from recruit training. Many have been specifically enlisted for ET training. The remainder are men sent in from the fleets. Practically without exception, they are high school graduates and many have college training. Waves are eligible for ET school and in November 1950 several were in attendance. Marines also attend the fundamental phase.

In addition to the class A (basic) school, which accounts for more than ninety percent of the student body, there is a class C (advanced) school offering seven courses ranging from four to twelve weeks of high level training on specific equipment. Students, all petty officers, number about ten men to a class, and are returned to their ships on completion. Classes in each course follow each other in heel and toe procession; a new one convenes on the Monday following the Friday graduation of its predecessor.

First Phase

The class A curriculum is divided into a fundamental and a practical phase. The first phase includes physics, applied mathematics, alternating and direct current theory, electron theory and radio fundamentals. It lasts twenty weeks and in the course of it each student must build a radio transmitter and superheterodyne receiver. These are later dismantled, and parts used again by following classes.

Instruction begins with a brief review of high school level work in each subject and progresses rapidly to high levels, especially in electricity and physics. Each student is issued a kit of tools and a slide rule, all of which he soon becomes proficient in using.

Innovations Reduce Time

Prior to April 1950 the first phase took up twenty-six weeks. The time reduction was accomplished, without trimming the curriculum, by means of two innovations. One of these was the cutting out of mathematics as a separate subject and introducing it in conjunction with subjects in which it is of practical use. In this way the student is not confronted with mathematics until he is at the point in his course where he needs to know a certain mathematical operation in order to proceed with the course. Logarithms, for instance, are learned conjointly with power transmission, and trigonometry accompanies alternating current. Students not too adept at abstract reasoning are thus enabled to master them without difficulty.

The second expedient for reducing time is known officially as "craftsman," or modified group instruction, and as the "tell-show-do" method among the instructors. In it, a single instructor takes a group of not more than twenty students and teaches them all subjects in specially-fitted laboratory-classrooms. He comes to know each man well, can spot his difficulties more easily and help him over them.

No single instructor takes a group all the way through, most groups having three different teachers in the

course of the twenty weeks. The method replaces a former system of formal instruction in separate classroom and laboratory spaces, with a different teacher for each subject.

The second, or practical phase, starts off with two weeks devoted to learning the calibration, maintenance and repair of electronic test equipment, which the student has already learned to use. All through this second phase the budding electronics technician works with the latest models of standard Navy equipment.

Masters of test equipment, the class next plunges into two weeks on standard shipboard radio transmitters, followed by two more weeks on communications receivers. Then comes a fortnight of sonar, in which the mysteries of fathometers, echo ranging gear and attack plotters are laid bare.

Introduction to UHF

The succeeding two weeks on special circuits is the students' introduction into the sphere of ultra high frequency. They learn the construction, function and analysis of wave forms produced by sweep, square wave and sawtooth wave generators. They become familiar with microwave oscillators such as the magnetron and the phantastron.

This fortnight is preparatory to the study of radar and other UHF equipment. Students are required to change and enlarge earlier concepts of electrical and magnetic theory to enable them to cope practically with electrical energy behaving in new and, to them, bewilderingly unorthodox ways.

Thus fortified they tackle three weeks of shipboard radar, exploring the intricacies of surface and air search equipment and fire control directors. Then comes a week each on loran and UHF communications equipment. The final week is devoted to radiological devices.

The class C schools are streamlined and highly specialized. Two are highly classified from a security standpoint. The remaining five are in UHF equipment, two models of fighter director radar, special fire control radar elements and air early warning equipment.

While ET school has the deserved reputation of being the Navy's most difficult class A school, it lacks that dread bogey of most schools, the final examination. A carefully planned and spaced series of current examinations eliminates unsatisfactory students shortly after they have begun to fail, thus avoiding the extra expense and time entailed in waiting until the end of the course.

In the first phase students get a weekly quiz of fifteen or twenty questions made up by their instructor and graded on a percentage basis. Any student who falls fifteen or more points below his class average is considered to be in a failing status. He is then interviewed to determine, if possible, the cause of his weakness in certain subjects.

The interviewing officer may assign him to additional instruction during supervised night study periods. These last from 7:00 to 9:00 p.m. and have special instructors. The officer can also, drop the failing student back to a class two weeks behind and let him cover the ground a second time, a "repeat" in ET school parlance.

Every five weeks each first phase class gets a comprehensive examination of fifty questions testing its mastery of the material studied during the period. Failures are dealt with as in the weekly quizzes.

ET school officers consider these special exams to be useful in gauging the ability of the instructor and in showing up weak spots in the curriculum as well as in checking on the progress of students. The class instructor is not permitted to learn the questions ahead of time to avoid the chance that he might unconsciously weight his teaching accordingly.

Board Checks Progress

The exams are made up by a curriculum development board consisting of two warrant officers as permanent members and nine enlisted men who serve about two months at a time and are chosen from the body of instructors. This rotation feature prevents the board from losing touch with the day-to-day realities of actual teaching techniques.

In the second phase students are examined every two weeks, fifteen points below class average being considered a failure and handled as in the first phase. The student's progress here is also checked by performance tests in which a piece of equipment is placed out of adjustment and the student set to finding the trouble.

(*Continued on page 64, col. 1*)

Administration office and second phase instruction building of electronic technicians school, Great Lakes, Ill.

Navy and Marine electronics technician students engaged in construction work.

school,

AERONAUTICAL COMMUNICATIONS— PRESENT AND FUTURE

By Captain Charles F. Horne, USN

Director of Federal Airways, CAA

From a speech delivered by Capt. Horne before the AFCA's Boston Chapter. Capt. Horne, formerly Deputy Chief of Naval Communications, is presently on loan to the Civil Aeronautics Administration.

The subject of aeronautical communition, present and future, is especially appropriate at this time because we recently have embarked upon a program which has been labeled "The Common Transition System of Air Navigation and Traffic Control." Efficient, reliable, speedy and fail safe communication is of course the backbone of the "Common System." By "Common System" I mean common to and used by all users of the airspace: private, executive, non-scheduled, scheduled, and public (includes military and all other government departments).

In the period immediately following World War II, it became increasingly evident that traffic control techniques existing at that time were inadequate to handle the rapidly rising volume of air traffic, particularly under adverse weather conditions. The CAA recognized the need for improved tools for the control of air traffic and that such tools were available from war born electronic development. The cooperation of other users of the airspace was requested in determining which of these war born devices should be utilized.

Accordingly, in April 1947, the technical advisor of the Air Coordinating Committee requested the Radio Technical Commission for Aeronautics to undertake a study of air traffic control for the purpose of developing recommendations for the safe control of expanding air traffic. The resulting RTCA Program embodied in the report of Special Committee 31 is intended to meet both military and civil requirements. It is not an unwieldly compromise, it is a common practical solution that is best for each service and for all services. The same system with the same tools gives the military maximum safety when operated to whatever capacity is required by military necessity. It gives civil aviation maximum capacity when operated to a specified standard of safety.

Present and Future Systems

The ultimate goal of the system entails the use of equipment that, it is estimated, probably will require some 15 or 20 years for complete development, installation, and the training of operators. Meanwhile, we are trying to provide something to relieve the existing congestion of the airways in the interest both of civil schedule reliability and of national defense. This is the so-called "transition program" and was proposed to be completely installed and operating within a 5 year period. We actually expect to have the salient features operating by 1953. These factors include very high frequency omnirange, distance measuring equipment, instrument landing system, airport surveillance radar, precision approach radar, very high frequency automatic direction finder, secondary radar, and mechanical interlock. The old four-course L/MF ranges will be decommissioned starting in 1952 and ending in 1954.

As a start on describing salient features of this system, which some people deem quite complex but which is basically not mysterious, let us consider communications methods and equipment of the transition period as presently used and then, quite broadly, probable communications equipment and methods of the ultimate system. I will refer to the first as "present" and the latter as "future."

First Postwar Years

In the immediate postwar period the only position information available to air traffic controllers was navigational estimates of positions as reported by aircraft pilots. These could be in error by many miles and many minutes of time either because of the lack of adequate navigation instruments in the aircraft or because of the delays inherent in the communications system. The use of additional controllers would have been of considerable benefit but as traffic increased this remedy would quickly have reached a point of diminishing returns. The volume of necessary communications which could be handled with the techniques existing in the period 1945 to 1947 was a limiting factor and oversaturation of communication channels existed in many areas. Position estimates received from the pilots of aircraft were manually posted and estimates were made from these postings to effect separation of aircraft.

At present aeronautical communications are handled by voice radio circuits for air/ground and ground/air communications and by interphone and teletype circuits for point to point communications. Most of these circuits will continue to be employed throughout the transition period. Air/ground circuits are handled through frequency bands ranging from "low" to "very high" depending, of course, upon the type of equipment carried in the aircraft. Communication may be between the tower and the aircraft or between an interstate airway communication station (INSAC) and the aircraft or directly between the air route traffic control center and the aircraft depending upon the position of the aircraft and the type of message. "Company" communications normally are used by scheduled carriers enroute. On controlled airways a pilot may communicate with ground stations by direct VHF voice contact or by voice channel on the CAA radio navigational facilities.

Point to point communications are grouped in four main categories, designated as Services "A", "B", "C" and "F". Service "A" is used for the transmission of meteorological data and notices to airmen concerning the status of radio aids to air navigation and field lighting conditions. Service "B" is used for the transmission of flight plans, messages checking on overdue aircraft, and administrative messages. Service "C" is primarily used for the handling of meteorological forecasts. All three are landline or radio teletype circuits. Existing teletype circuits transmit at the rate of 60 words per minute. Within the next two years we hope to standardize and commence installation of 100 words per minute or faster equipment since traffic congestion already requires parallel circuits to handle load between some points.

The above aeronautical communications networks are composed of direct circuits and long line circuits, which are interconnected by relay and/or through switching stations. Relays of meteorological data and notices to airmen are accomplished with automatic teletype equipment and are relayed from circuit to circuit at scheduled periods. This permits the use of data throughout all of our facilities.

Service "F" circuits are interphones and are used for the transmission of traffic control clearance and position reports, acceptance flight time data, and information involved in coordination between air route control centers, towers, communications stations, and aircraft control agency operations offices.

With the information obtained from the teletype circuits at our communications stations, together with pertinent data concerning CAA radio aids to air

navigation, CAA personnel effectively brief pilots, prior to flight, regarding conditions probably to be encountered during their prospective flight.

Two significant steps that have recently been taken promise to raise communications efficiency quite considerably. The first is the CAA program of mechanical interlocks between the airport traffic control tower and air route traffic control center. The second is the inauguration of direct communication between aircraft and certain ATC centers as the aircraft enters the terminal area and before the aircraft enters the outer pattern at a given terminal.

When aircraft arrive in the vicinity of an airport under reduced visibility conditions, they leave the jurisdiction of air route or "enroute" traffic control, and come under the jurisdiction of airport traffic control. The coordination required between air route control and tower control to ensure fail-safe procedures in this critical area, requires a communications system more versatile than normal telephone or teletype circuits.

The CAA has assisted in development of a device known as the mechanical interlock to meet this problem. By use of this equipment both the control tower and air route traffic control center are visually advised of the altitudes occupied by aircraft or those altitudes which have been reserved for aircraft. The equipments interlock so that it is impossible for one control facility to assign an altitude to an aircraft if the altitude already has been previously assigned to another aircraft. Automatic visual indication is given to both the control tower and control center when altitudes are vacated without the necessity of the verbal exchange of information. The equipment operates on a single pair of wires and may be located at any airport where traffic congestion demands this service, connecting its tower to the responsible ATC center.

Eliminating "Middle-man"

During flight, aircraft communicate with traffic control centers either through company communication channels or through the interstate aeronautical communications stations operated by the CAA. Heretofore, direct communication with CAA traffic control towers was not undertaken until the aircraft had reached the inner pattern or stack. Direct aircraft pilot to center controller communications, immediately prior to the aircraft's entrance to the outer pattern, now provides more efficient positioning at outer fixes by reducing the communications lag occasioned by the presence of a communications "middle man" or third party.

I would like to digress slightly at this point to describe some of the navigational equipments of the "Transition System" and give you a brief report of the implementation status of each.

The basic short range navigational aid of the "Transition System" is the very high frequency omni-directional radio range which we term "omnirange." As the name implies, this facility provides navigational guidance to or from the range itself throughout 360 degrees of azimuth. Readings on two or more facilities may also be used by pilots flying "off course" for fixing purposes. For basic enroute coverage, the CAA expects to operate approximately 400 omniranges. Of these 400, 271 have been commissioned at this time. The remainder are either operating on test, to be commissioned shortly, or are under construction. It is anticipated that our enroute omnirange program will be substantially completed by June 30, 1951.

DME, ILS, and GCA

The transition period instrument landing system provides lateral and vertical guidance to pilots making approaches to airports during periods of low visibility. We visualize the installation of ILS at all major airports. At the present time, the CAA is operating 92 instrument landing systems. In addition, we have 79 in various stages of survey, construction and final installation. At low traffic density locations which do not fully justify the expenditures necessary for ILS installation, it is the plan of CAA to install the omnirange or some modification of the omnirange as a letdown facility.

Distance Measuring Equipment is essentially a ground radar beacon which is continuously interrogated by equipment in the aircraft. The time it takes a pulse to travel from the aircraft to the beacon and return to the aircraft is measured electronically and displayed on a calibrated cockpit instrument which indicates to the pilot the distance in miles from aircraft to ground station. The CAA plans to equip all omniranges and instrument landing systems with this device. A recent contract provides for deliveries on a major portion of this equipment beginning in March 1951 and continuing at the rate of 40 equipments per month until a total of 450 equipments will have been delivered.

You are all probably familiar with the radar device developed during the war for low approach and landing known as ground controlled approach (GCA). The CAA has separated this equipment into its two basic components of airport surveillance radar and precision approach radar. Airport surveillance radar is to be used for air traffic control purposes in the terminal area and for vectoring aircraft directly to a gateway position. From that point if the aircraft is landing by means of ILS, its landing may be monitored by precision approach radar or if the aircraft does not have ILS equipment, it may be "talked down" by PAR. At present 4 ASR-PAR combinations are commissioned at U. S. airports. In addition, 43 ASR's and 19 PAR's are in various stages of manufacture, construction or installation. With each airport surveillance radar there will be installed a very high frequency automatic direction finder which identifies on the scope the aircraft which is in contact with the controller. By the end of this fiscal year it is expected that approximately 50 of these equipments will be installed.

The previous remarks were directed towards describing the transition period equipments and requirements of the "Common System." The ultimate system of airways communications probably will be accomplished through new and improved equipments to be developed under the direction of the Air Navigation Development Board. This board is composed of members of the armed services and civilian agencies, one each from the Air Force, Army, Navy, CAA and the aviation industry. Development contracts are monitored by the technical staff of the ANDB and normally are assigned to appropriate government laboratories or through them to private industry laboratories or universities.

Private Line

In the future, or ultimate, system air/ground communication probably will be accomplished by "private line." The report of RTCA Special Committee 31 stated that the functional characteristics of private line shall provide for the automatic, fail-safe, transmission of air traffic control information (clearances, requests, and confirmations) between aircraft and the ground. This shall include the ability to receive air-derived navigational information from the aircraft. It shall be possible to display the intelligence received over the private line in a suitable manner for monitoring by the control operator. The private line shall be capable of feeding information directly into the airspace separation and flow control elements. By use of this equipment, it shall be possible to communicate with aircraft in blocks of airspace of some five miles square and 1000 feet vertical thickness without knowledge of the aircraft identities and without requiring cooperation of the aircraft's navigation equipment. In its relation to other equipment, the ground private line element will receive traffic control requests, confirmations and readings of the aircraft's navigation instruments from the airborne traffic control equipment, (distance, bearing and altitude position reports), and send this information to the flow control equipment, through the airspace separation equipment. In addition, the private line element will receive traffic control information, clearances, confirmations, et cetera, forwarding the data to the appropriate aircraft and presenting it to the pilot on a visual display.

Ideally, the projected system of Air Navigation and Traffic Control should be established in the frequency bands 960-1215 Mcs and 1300-1600 Mcs. It is believed that the two airborne equipments and their ground/air links can

(*Continued on page 60, col. 2*)

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SIGNAL

Carrier-Radio Control For A Communications System

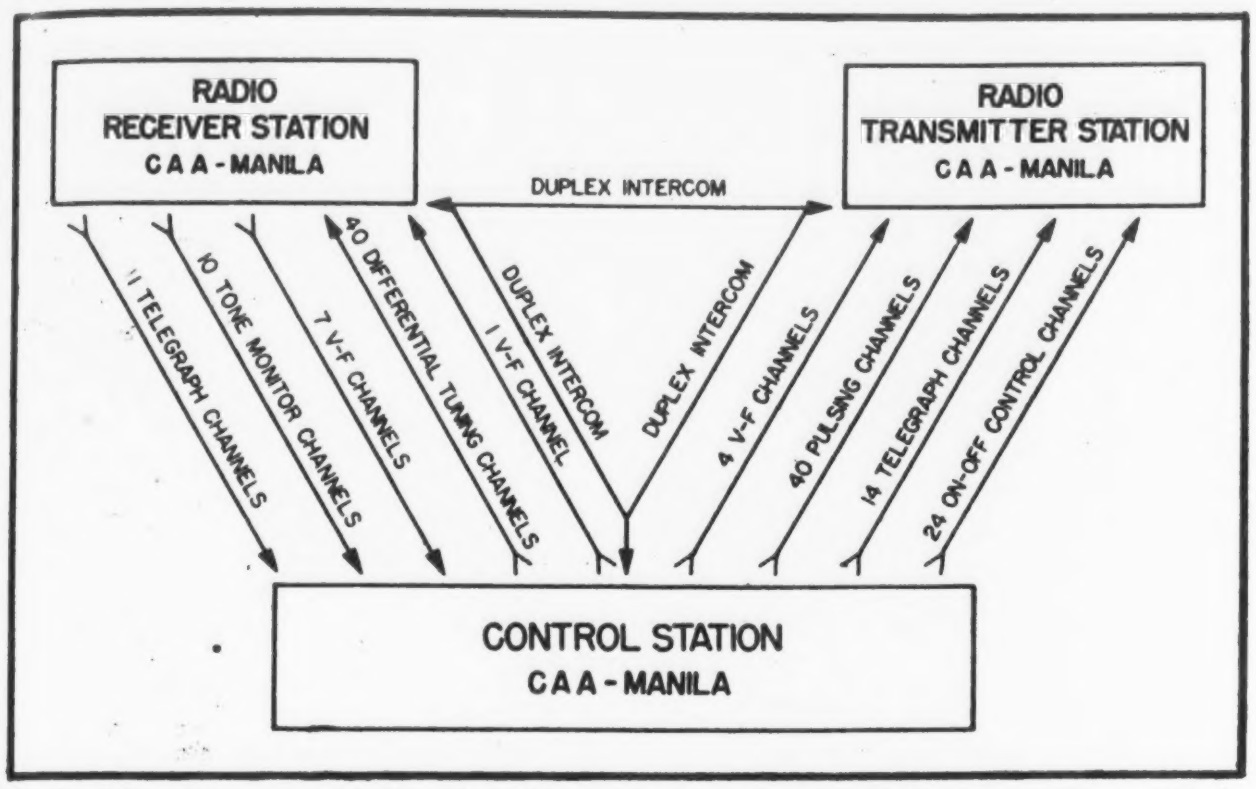


Fig. 1. Schematic representation of various control and communications channels provided Lenkurt Carrier at Manila airport installation.

By George F. Koth

Lenkurt Electric Company
San Carlos, California

In the general arrangement of radio communications installations it has long been conventional to place receivers and transmitters in ideal sites remote from the control center and interconnect the three locations by wire line. Operating personnel are provided with control facilities, while both incoming and outgoing transmissions also pass over these lines.

In designing a complete new communications system for Manila International Airport — under the Philippine Rehabilitation Act of 1946—the U. S. Civil Aeronautics Administration used a new scheme based on successful small-scale tests at other CAA installations. Due to a combination of unsettled conditions and a well known tendency for uninformed natives to cut down wire or dig up cables for clothes lines and other domestic applications, it was decided to install f-m radio links in the 160-mc band operating over line-of-sight distances between transmitter, receiver and control stations. The usable transmission bandwidth of 300 to 28,000 cycles was divided into channels for control and communication by means of Lenkurt Type 44 Carrier equipment.

Below: Air view of the Lenkurt Electric Co. plant in San Carlos, Cal. where all Lenkurt Carrier equipment is designed, developed, and manufactured.

The overall system is shown diagrammatically in Fig. 1. Exterior views of the receiver station, the transmitter station and the control station are shown in Fig. 2, 3 and 4, respectively. Figure 5 illustrates the control tower. In operation, the system provides facilities for radio communication by either radiotelegraph or radiotelephone with aircraft in flight; exchange of information necessary to the operation of the many airline companies concerned—by radioteletype or radiotelegraph; and intercommunication between the three stations.

Inside the control center, illustrated

Lenkurt's experience in the development and manufacture of electronic equipment dates back to 1935. In 1943 the name Lenkurt Electric Co. was adopted and the company's entire activities were directed toward the development and manufacture of carrier current communications equipment. In 1945 arrangements were made for world wide distribution of Lenkurt's expanding line of carrier equipment through the world-wide sales organization of the Automatic Electric Co.

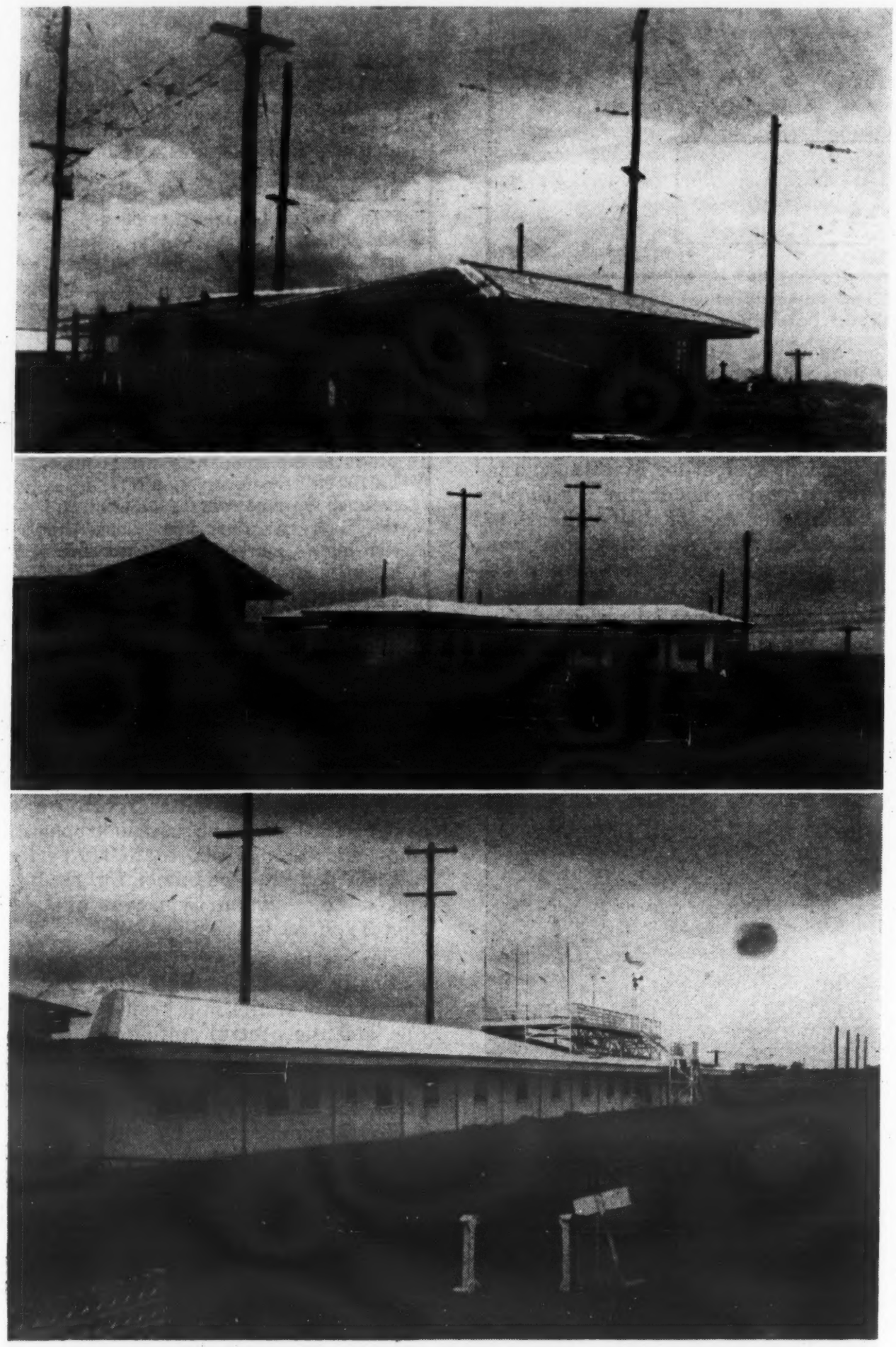
By 1947 demand for Lenkurt products was great enough to dictate a large increase in production capacity and the new plant, illustrated on page 25, was erected in San Carlos, about 20 miles south of San Francisco. Today, Lenkurt's modern plant and laboratory facilities are staffed by an energetic and well organized group of over 250 people. Engineering and production activities are carried out under direction of the same administrative staff and in very close coordination with sales and field engineering organizations. Present production is at a $2 million yearly rate. An active components division produces the company's own requirements in transformers, filters, coils, molded iron-powder products and the like. At the same time, this division is marketing an increasing quantity of these products to other manufacturers.

in Fig. 6, there are seven operators' positions for air-ground communication. Each operator can make dial selections of transmitter frequencies desired and can either voice-modulate or manually key the transmitters with semi-automatic—or bug—telegraph keys. He can continuously adjust the frequency and sensitivity controls of his receiver and listen to the audio output—either voice or telegraph—over one of the seven voice-frequency channels indicated in Fig. 1.

Provision is made for monitoring a great enough bandwidth to insure reception of transmissions from aircraft whose transmitters are not exactly adjusted to their proper frequencies. Thirteen positions are devoted to point-to-point, weather, and auxiliary services which use manual telegraphy as well as frequency-shift teletype. Corresponding controls are available to these operators.

The type 44 Lenkurt Carrier equipment used, creates separate channels by the principle of frequency division. The equipment racks of the control station are shown in Fig. 7. In the frequency-division system, filters are used to separate the band from 300 to 2800 cycles from the remainder of the radio transmission bandwidth up to 28,000 cycles. This lower band is used directly for voice transmission. The upper section is divided into six more channels of corresponding width by a series of modulators which convert the frequencies

Fig. 2, top: Building and antennas of the remote receiver station in the Manila system.
Fig. 3, center: Building and antennas of the remote transmitter station.
Fig. 4, lower: Control station station from which Manila receiver and transmitter stations are operated by remote carrier on radio links.



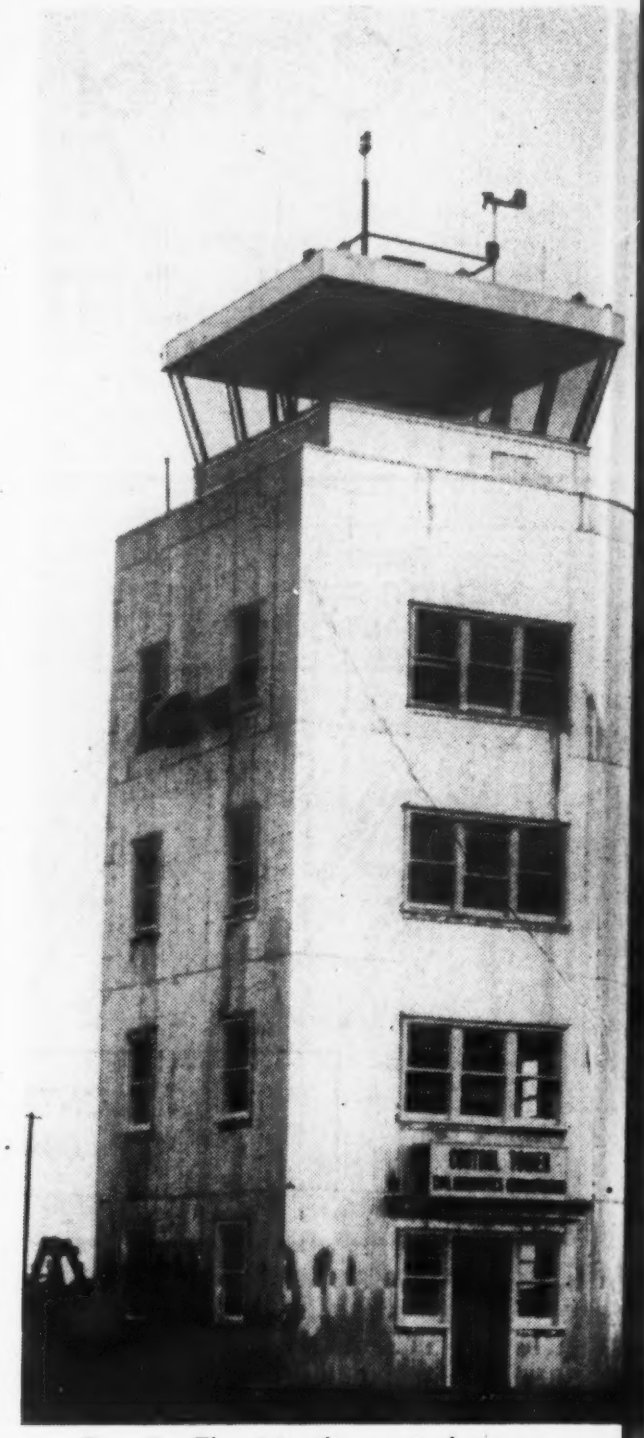


Fig. 5. The Manila control tower.

of incoming signals to the correct frequency bands to fit into their assigned position in the general scheme. Then the entire composition signal thus formed is transmitted simultaneously over the radio link.

Filter System

At the receiving end of each link, a corresponding arrangement of demodulators and filters divides the composite signal up into two original parts and routes these parts to the various equipment units they are intended to control or energize. Because of the differences between kinds of controls and signals involved, the system has additional filters to subdivide some of the six upper channels into sub-channels of various widths to accommodate (1) simple on-off controls, (2) transmitter dialing impulses or telegraph signals, and (3) differential signals to operate reversible electric motors for tuning or other shaft rotating functions. The total number of each of these kinds of sub-channels is shown in Fig. 1. The carrier equipment in the transmitter station is shown at left in Fig. 8. On the right are the transmitters which are being remotely operated and modulated.

Among the functions listed above, No. 1 and 2 are handled by pulses and the differences between sub-channels relates to bandwidth—more rapidly oc-

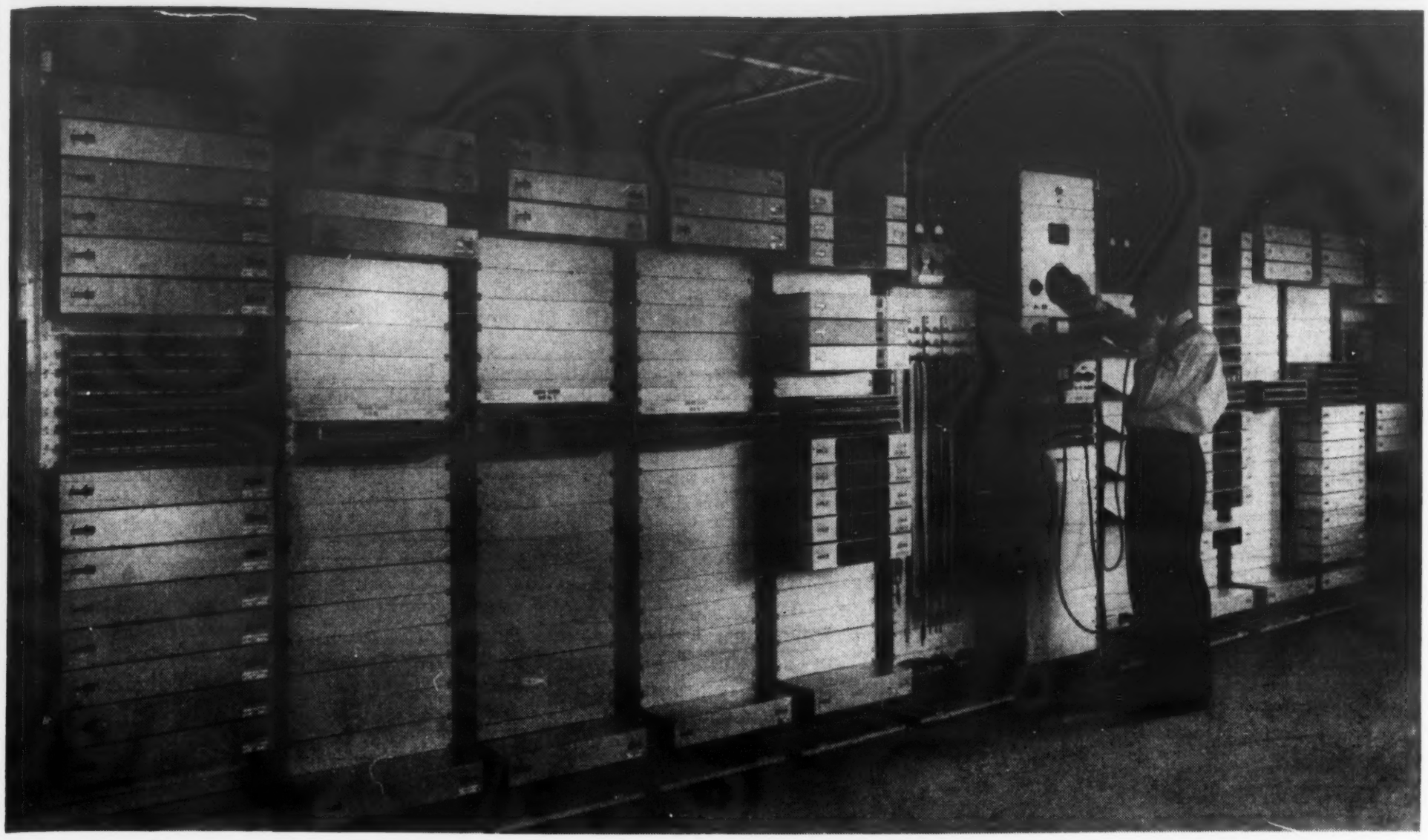


Fig. 7. Closeup of control-station carrier racks of Manila Airport system.

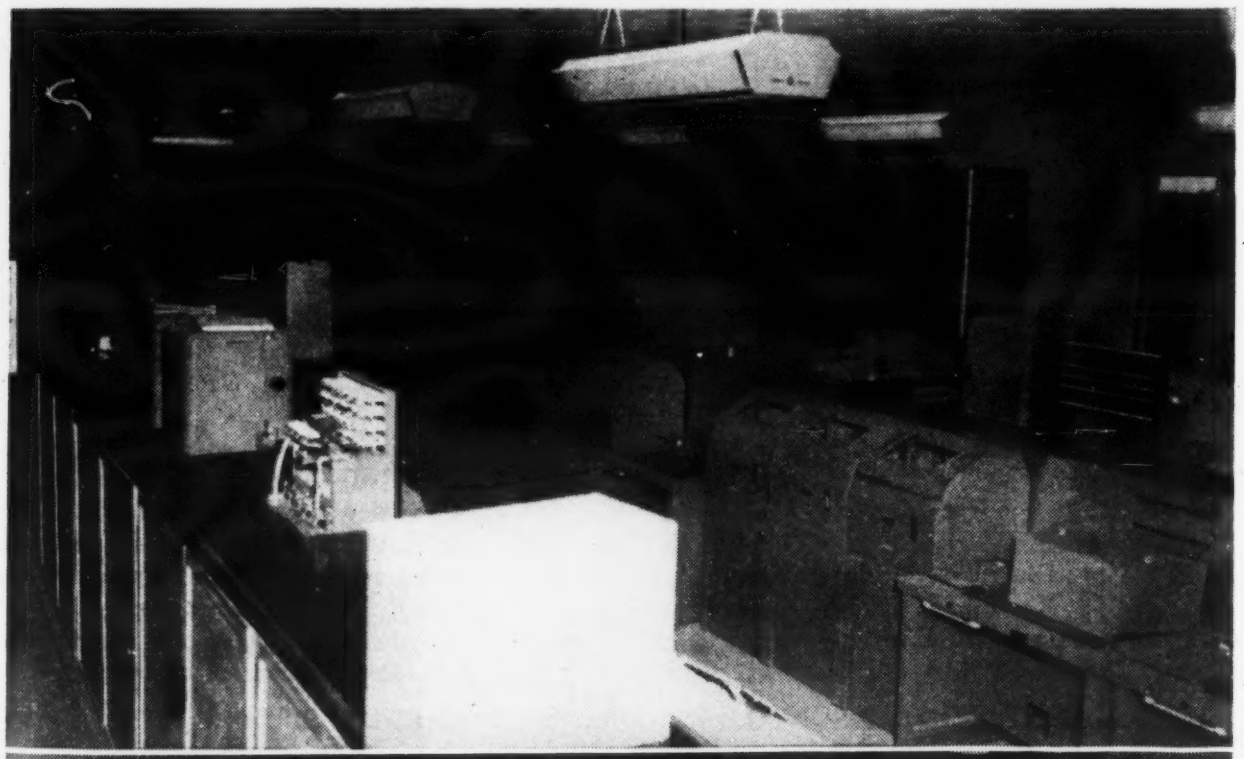
curring pulses requiring a wider band. Variations in level caused by fading on the radio links have relatively little effect on these transmissions. Function No. 3, however, is based on signals of differential level being so arranged that the motor is at rest when there is no signal.

Turning a knob counterclockwise at the operator's position causes the transmission of signal at a nominal level which actuates the control motor for corresponding counterclockwise rotation. Opposite rotation of the knob causes the sending of signal at a different level resulting in opposite rotation of the motor.

To assure that fading on the link will not produce this same effect—and therefore false control—a pilot regulator is incorporated in the system. This unit, which operates very much like a super automatic volume control in a radio receiver, maintains received signal levels within a narrow margin despite serious fading on the link. An alarm system is also connected in such a way as to warn the operator whenever the full regulation available is not sufficient to restore normal conditions within 30 seconds. This time is allowed to avoid alarms from transient conditions of such short duration as to have no effect on the control equipment.

Fig. 6, upper: Interior view of control station showing equipment under installation in operators' position.

Fig. 8, lower: Equipment bay in transmitter station showing carrier equipment at left, remote-controlled transmitters at right.



Carrier-Radio Control Value

This complete communications system has been in operation for almost a year and results have been in accord with the original concept that carrier-radio control links are actually *more* dependable than wire-line links. Such systems, therefore, have broad military significance for the operation of communications networks in areas where land lines are difficult to establish and vulnerable to service interruptions or where rapid installation of a major communications system is essential.

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4th Vice-President
C. O. Bickelhaupt

5th Vice-President
David R. Hull

Counsel:
Frank W. Wozencraft†

Executive Secretary:
George P. Dixon†

DIRECTORS

1951

W. J. Halligan
Wm. C. Henry
David R. Hull
Frederick R. Lack*
A. W. Marriner
Leslie F. Muter
C. E. Saltzman

1952

Jennings B. Dow
Theodore S. Gary
E. K. Jett
J. Harry LaBrum
David Sarnoff
W. W. Watts

1953

Maj. Gen. F. L. Ankenbrandt, USAF
C. O. Bickelhaupt
J. R. Cunningham
Walter Evans
Thomas J. Hargrave
Rear Adm. E. E. Stone, USN

1954

George W. Bailey*
Wm. H. Mansfield
G. F. Metcalf
Edward M. Webster*
Joseph C. Wilson*

******Executive Committee Member*
†*Executive Committee Member, non-voting*

ASSOCIATION AFFAIRS

COMMUNICATIONS • ELECTRONICS • PHOTOGRAPHY

Chicago National Meeting Shaping Up

Sprague Will Be Principal Speaker

Preparations for AFCA's Annual National Meeting for 1951 are rounding out, with the host chapter, Chicago, hard at work on the details of the planning.

The principal speaker for the convention, addressing the members and guests at the banquet April 20th, will be Robert C. Sprague, president of the Radio and Television Manufacturers Association, and of the Sprague Electric Company.

Technical forums in electronics and photography will highlight the national meeting, April 19, with nationally known industrial leaders conducting discussion pertaining to military and civilian defense requirements and production. These discussions are expected to result in the formulation of plans for a closer coordination between military and civilian allocations.

Current problems of communications will be stressed by Leslie F. Muter, an AFCA national director and past president of the RTMA, in the keynote address of the convention on the opening day, April 19.

Detailed discussion by industries will be conducted in forum meetings by industrial leaders in the fields of land lines, radio communications, and photography. Heading the land line forum will be James H. Kellogg, president of the Kellogg Switchboard & Supply Company. William J. Halligan, Sr., president of the Hallicrafters Company, and a national director of AFCA, will conduct the panel on radio communications. William C. DeVry, president of the DeVry Corporation, will head the discussion on photography.

On the second day of the meeting, April 20th, the convention visitors will be conducted through communications-electronics-photography plants of several of the Chicago AFCA company group members.

For the third day of the convention, April 21st, there will be available to the AFCA visitors an inspection trip aboard a U. S. Naval Escort Destroyer.

High point of the meeting will be the annual banquet, April 19, when Mr. Sprague will deliver his address to the convention visitors. The RTMA president, it is expected, will map a course for the AFCA industry members for the difficult days ahead.

FIFTH ANNUAL CONVENTION

Convention Chairman, A. F. Lang
3rd Floor
1033 West Van Buren Street
Chicago 7, Illinois
PROGRAM:
APRIL 19

TIME	EVENT
0900	Registration opens, Drake Hotel, Chicago
1000 to 1200	Council and Directors' Meeting
1230	Keynote luncheon, Principal Speaker — Leslie Muter. Welcome by Theodore S. Gary, National President, and Oliver Read, Chicago Chapter President.
1400	Chapter Presidents' Meeting
1430 to 1630	Forums Landlines — Moderator, James H. Kellogg. Radio Communications—William Halligan, Sr. Photography—William DeVry
1730	Reception and Cocktails
1900	Dutch Treat Dinner (optional)
2000	Entertainments (will be detailed later)

APRIL 20 — PLANT TOURS:
Tour No. 1—Bell & Howell Co. and Sentinel Radio Co.
Tour No. 2—Automatic Electric Co. and Motorola, Inc.
Tour No. 3—Teletype Corp. and Rauland Corp.
Tour No. 4—Western Electric Co. and Webster-Chicago Corp.
Tour No. 5—Hallicrafters, Inc., and State Civil Defense Control Center and Filter Center Ground Observer Corps.
Luncheon included in all above tours.

1800	Cocktail Party—Chicago AFCA Group Members as Hosts.
1930	AFCA Convention Banquet and Entertainment. Principal Speaker, Robert C. Sprague.

APRIL 21—Inspection Trip aboard U. S. Naval Destroyer Escort *Daniel A. Joy.*

COST PER PERSON: All inclusive* for April 19/20—$18.50
April 19—Registration and Luncheon $6.00 (No charge for Forum.)
April 20—Registration and Banquet $10.50
April 20—Registration, Luncheon, Plant Tours & Banquet $13.50

*Except for Dutch Treat Dinner on April 19 and/or Destroyer trip and luncheon on April 21.

AFCA's 1951 NATIONAL MEETING APRIL 19-20-21 AT

CHICAGO

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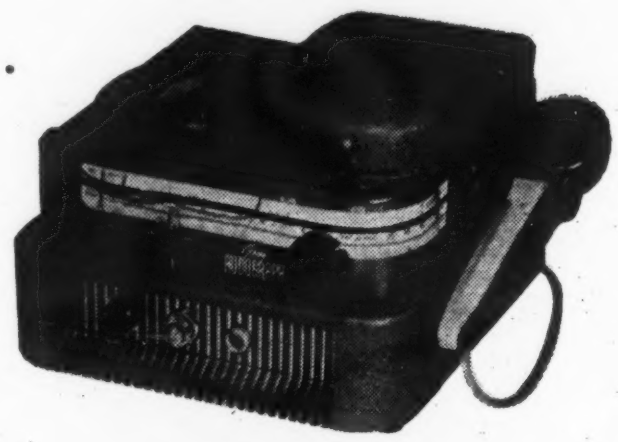

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- Street..... City.....

W. Walter Watts

Wally Watts Goes to DPA

One of the AFCA's strongest supporters and hardest workers in behalf of association programs and activities was temporarily lost to the association, probably for the duration of the present emergency defense mobilization effort, when AFCA 1st vice president W. Walter Watts received an assignment with the Defense Production Authority in Washington, D. C. His duties with DPA will undoubtedly allow little, if any time for other activities.

Colonel Watts, on leave of absence as vice president of the RCA Victor Corp., has been designated chairman of the DPA's production executive committee, through which overall coordination and direction of defense will be exercised by the DPA Administrator, Maj. Gen. William H. Harrison.

In addition to being AFCA's 1st vice president, Col. Watts is a director of the association, and the national director for chapters.

Executive Committee Meeting

The AFCA National Executive Committee met at Washington, D. C., January 16, 1951, to cover association matters for the third quarter of the fiscal year. The following members were present: Chairman Theodore S. Gary, Frederick R. Lack, W. Walter Watts, Earl E. Stone, Frank W. Wozencraft, George P. Dixon.

Actions taken at the meeting included voting of an increase in the membership of the executive committee from five to seven members. The two additional members voted in were George W. Bailey, executive secretary of the I.R.E. and president of the ARRL; and Joseph C. Wilson, president of the Haloid Co. Mr. Bailey, in addition, was named the chairman of the nominating committee for the coming year's officers and directors to be elected at the April convention in Chicago.

AFCA GROUP MEMBERS

Communications—Electronics—Photography

Listed below are the names of the American firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation in our special fields.

Acme Telectronix
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Phenolic Corporation
American Radio Institute, Inc.
American Radio Relay League
American Steel & Wire Company
American Telephone & Telegraph Co.
Anaconda Wire & Cable Company
Argus Cameras, Inc.
Arnold Engineering Company
Astatic Corporation
Automatic Electric Company
Automatic Electric Sales Corp.

Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bendix Radio
Bliley Electric Company
Breeze Corporation, Inc.
Burnell & Company

California Water & Telephone Co.
Capitol Radio Engineering Inst., Inc.
Carolina Telephone & Telegraph Co.
Central Radio and Television Schools
Chesapeake & Potomac Tel. Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Corning Glass Works
Coyne Electric School, Inc.

Da-Lite Screen Co., Inc.
Diamond State Telephone Co.
DuMont, Allen B, Laboratories, Inc.

Eastman Kodak Company
Eby, Inc., Hugh H.
Electronic Associates, Inc.
Electronic Research, Inc.
Espey Manufacturing Co., Inc.

Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.

General Aniline & Film Corp.
General Cable Corporation
General Electric Company
General Instrument Corp.
General Telephone Corp.
Gilfillan Bros., Inc.
Graflex, Inc.
Gray Manufacturing Co.

Hallicrafters Company
Haloid Company
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motors Corp.
Hoffman Radio Corp.

Ilex Optical Co.
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Indiana Steel & Wire Co.
Institute of Radio Engineers
International Resistance Co.
International Tel. & Tel. Corp.

Jacobsen Manufacturing Co.

Kellogg Switchboard & Supply Co.
Kleinschmidt Laboratories, Inc.

Lavoie Laboratories
Leich Sales Corporation
Lenkurt Electric Company, Inc.
Lewyt Corporation
Loral Electronics Corporation

Machlett Laboratories, Inc.
Magnavox Company
Mallory & Co., Inc., P.R.
Martin, Glenn L., Company
Merit Transformer Corp.
Michigan Bell Telephone Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.

National Carbon Company, Inc.
National Company, Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.

Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Operadio Manufacturing Company

Pacific Telephone & Telegraph Co.
Philco Corporation
Photographic Society of America
Precision Apparatus Co., Inc.

Radiart Corporation
Radio Condenser Company
Radio Corporation of America
RCA Victor Division
Ray-O-Vac Company
Raytheon Manufacturing Company
Reeves Instrument Corp.
Remington Rand, Inc.

Saxonburg Potteries
Sherron Electronics Co.
Simmon Brothers, Inc.
Smuckler & Company, Inc., A. F.
Society of Motion Picture Engineers
Sonotone Corporation
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sperry Gyroscope Company
Stackpole Carbon Company
Stupakoff Ceramic & Mfg. Co.
Sylvania Electric Products, Inc.

Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Tung-Sol Lamp Works, Inc.

United Radio Television Institute
United States Rubber Company
United Telephone Co.

West Coast Telephone Co.
Western Electric Company, Inc.
Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company

A page from the note-book of Sylvania Research

Color Television Research Accelerated by Study of Color Phosphors in Demountable Vacuum System

Sylvania's physicists, chemists and engineers have carried out fundamental research and development on color television tubes for a considerable period of time.

These basic investigations into practical color television tubes for home and industry have been conducted at Sylvania's Research Laboratories at Towanda, Pennsylvania, and Bayside, New York. Typical of the exceptional facilities and advanced research techniques used at the Sylvania laboratories is the demountable vacuum system shown in the photo.

Developmental samples of phosphor screens for color television tubes may be placed in the tube for study and test. Similarly developmental models of three-color electron guns may be placed in the neck of the demountable evacuated envelope and characteristics studied.

This continual basic research has enabled Sylvania to pioneer in providing the television tube industry with a complete selection of phosphors for color picture tubes. It has also paved the way toward more advanced research into the design and construction of color television tubes and circuits. It is typical of Sylvania's never-ceasing emphasis on *productive basic research*.

The operator is observing a spot of light on the phosphor screen of a developmental color television tube. By varying voltages applied to a three-color electron gun inserted in the demountable vacuum system, she can obtain data useful in improving both phosphors and gun designs for color television tubes.

SYLVANIA ELECTRIC

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

Addresses Unknown

Copies of SIGNAL mailed to the below listed members have been returned to us because the latest addresses we have for these names are incorrect. If you know the present address of any of these members please jot it down on a postcard and send it to us.

Cadet A. G. Alateras
W. H. Anderson
Alexander Angelich
Gregory J. Ardizzone
Paul H. Bacon
Alexis Badmaieff
M. Barnett
Ernest Berlucchi, Jr.
Walter C. Blatner
1st Lt. Gerald A. Boule
Sgt. Wm. T. Bowiassa
Maj. L. W. Brittingham
Lt.Col. Wesley E. Calkins
Capt. Jim K. Collums
Cpl. Ralph Corck, Sr.
Mr. Joseph Corig
Sgt. Joseph P. Cox
Ernest B. Cutler
Maj. Franklin M. Davis, Jr.
Pat H. Davis
Lt.Col. Sidney S. Davis
Sgt. Claude V. Deats
Sgt. James A. Devlin
Lt.Col. Jasper N. Dorsey
Arthur F. Driscoll
Mr. Carl P. Dunkel
Capt. William F. Dye
John D. Feehan
Capt. G. S. H. Feger, Jr.
Maj. Robert M. Fridy
Louis S. Gage
Beverly C. Gibson
Louis Glovanos, Jr.
1st Lt. James H. Gooden
J. R. Hansen
1st Lt. Howard J. Hanson
1st Lt. Alan Harwood
Capt. Fred J. Hays
Maj. J. W. Heatwole
Capt. Walter Hensel
1st Lt. Randall L. Hoadley
Capt. A. E. Hodsdon, Jr.
T/4 Jack W. Hoke
Andrew A. Horner
Lt.Col. Roscoe C. Huggins
Capt. Burell B. Jackson
Col. Leonard W. Jackson
Major T. P. Jaszczult
Cpl. Akira Kaneshire
1st Lt. Harry A. Karch
Lt.Col. John P. Kemon
Branson Kinney
Richard Koultchakian
1st Lt. Lauren L. Lawlis
1st Lt. R. W. Lemme
Robert D. Livingston
John F. Lubinski
Robert R. Lyon
1st. Lt. H. V. Madden
Lt.JG R. Marmet, USN
Lt. Doyne K. Martin
Maj. W. D. Middleton
Philip N. Migdal
Maj. Sidney A. Miller
Lt.Col. B. Mincer
Maj. Earle F. Mitchell
M/Sgt. Doyle W. Morris
2nd Lt. Robert J. Morris
Phillip L. Newton
Lt.Col. W. V. Norton
Sgt. John W. Owen
1st Lt. F. R. Partridge
John W. Pearce
Capt. Henry W. Pike
George V. Porter
Capt. R. J. Price
2nd Lt. D. V. Puccio
Robert M. Ragland
Lt.Col. Maynard C. Raney
Capt. Manfred D. Ratliff
Capt. F. G. Reinhard
George L. Renfeldt, Jr.
1st Lt. I. D. Richardson
2nd Lt. Bernd Ross
M/Sgt. William H. Seip
Lt.Codr. Robert F. Shimp
Harold Silverstein
Wilbur Smith
2nd Lt. Fred B. Stevenson
Charles H. Teskey
G. F. Thompson
William F. Thompson
Frank C. Vondrasek, Jr.
1st Lt. W. F. Wersschier
R. A. Wetzel
Overdown Whitmire
CPO J. A. Wicker, USNR
Orla H. Wielziner
Sgt. Eldon E. Wood

Executive Committee Meeting

(*Continued from page* 30)

Maj. Gen. F. L. Ankenbrandt, Director of Communications, USAF, was elected a national director to fill a vacancy in the class of 1953. This action was unanimously regarded as felicitous, since Gen. Ankenbrandt has always been a strong AFCA supporter.

Executive Secretary George P. Dixon's report, delivered at the opening of the committee meeting revealed that two new chapters of the AFCA will soon be activated. A Gulf Coast Chapter, which will be located at Keesler Air Force Base and Jackson, Miss., is being established mainly through the efforts of Col. John McDavid, Col. Justin A. Courtenay, and AFCA Director William Mansfield. The other new chapter being activated is at Portland, Oregon, under the direction of F. A. Dresslar, vice president of the Pacific Tel. & Tel. Co.

In connection with the forthcoming national annual meeting, in April at Chicago, President Gary appointed a nominating committee, in accordance with our constitution and by-laws, to prepare a slate for presentation to, and consideration by the board of directors at the Chicago convention. The committee named by President Gary are as follows: Chairman, George W. Bailey (New York); Wm. H. Mansfield (Atlanta); Oliver Read (Chicago); Harry E. Austin (San Francisco); and Frederick R. Lack (New York).

AERO

The following interesting account by Lewis C. Mattison, based on material from the CIC magazine, has been received concerning the Association of Electronic Reserve Officers.

About four years ago a group of ex-Navy and Marine CIC, air warning and fighter director officers got together socially to talk over their experiences and take a look at each other in civilian clothes.

Most of these men had known each other for several years. Some of them had helped conceive the original CIC (Combat Information Center) and had contributed to its rapid development throughout the war. They had operated the CIC's of the fleet, had trained younger officers and enlisted men, had directed fighter squadrons in countless air battles, had helped navigate task forces, control shore bombardments. and direct close air support, and had done staff and planning work.

This common background led to further gatherings, but it was soon apparent that, due to their wide operational experience and interest in electronics, their common bond was more professional than fraternal. More important, it was apparent to them that with wholesale demobilization, the Naval establishment was losing almost *in toto* the trained body of reserve officers who had manned the CIC's and related systems afloat and ashore.

They consequently formed the Association of Electronic Reserve Officers, with objectives of considerably greater importance to the armed forces than the social ones which had brought them together.

Today, AERO exists as a relatively small (because of its qualifications for membership) but significant group of veterans, who in civilian life follow many professions but who have in common a deep interest in their wartime specialty and its applications to national defense.

AERO reports that it has assisted in the formation of reserve CIC units; that it is associated with the RTCA (Radio Technical Commission for Aeronautics) in the capacity of authorized observer; that it maintains liaison with the Institute of Navigation, the CAB and other governmental agencies, as well as with appropriate offices in the Army and the Air Force. Its representatives have engaged in CIC conferences in the office of the CNO, and on several occasions have performed training duty in the fleet and in OpNav. In 1949 a special panel of five of its members conducted a comprehensive survey of reserve CIC training under the auspices of the office of the CNO.

AERO's members are scattered from Boston to Los Angeles. Some of them are currently on duty with the fleet in Asiatic waters, some have been ashore in Korea with the ground forces. Others are on active duty in Washington. But AERO remains an independent civilian body, with no official ties.

The national organization has its headquarters in New York, with an elected Board of Directors of five and an Advisory Council of nine. Monthly meetings of the Board are held, and annual dinners carry on some of the social aspects of the original group. The stated objectives of the Association are (1) to foster interest in operational electronics, and to promote military and civilian training in the significance of electronics devices and techniques for national defense, and (2) to make available to the military establishment and the civilian agencies of the government such assistance, advice and counsel as may be appropriate.

Participation of AERO in naval activities, such as training periods, conferences and advisory assignments, is by individual members as reserve officers. Similarly, members may belong to units of the Reserve, but AERO itself is in no way officially connected with the Navy.

As in wartime, when these men were helping with the tactical and operational development of radar, the organization and exchange of information between them is on an informal and direct basis.

AERO believes, and preaches, that electronic control systems, however impressive their technical complexity, are only as good as the men who direct their tactical employment. In combat, authority for this employment must be delegated by commanders to (usually) junior officers who are specially trained and on whom lies the burden of the execution. It is in the role of independent critic and advisor to the armed forces in this field, based on the combined experience of its membership, that AERO believes its value exists.

CROSLEY IS READY AGAIN

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BUSINESS WEEK, MARCH 19, 1949

[Aviation Corp., now AVCO Manufacturing Corp., of which Crosley is the largest manufacturing division.]

Again Crosley places its greatly expanded facilities at the disposal of the military.

Crosley offers an outstanding group of electronic scientists and engineers, ready-trained to production requirements, seasoned in teamwork.

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Crosley offers 3,300,000 square feet of floor space in modern, well-dispersed plants, completely tooled and equipped with the most up-to-date automatic machinery, materials handling systems, etc. More than 700,000 square feet of this space is currently producing radio and television receivers, with a capacity up to 3,000 sets per day.

And Crosley stands ready to repeat (on a still larger scale) its performance in World War II. Then Crosley was the first to be called in on the development of the proximity fuse and made an outstanding record in producing the most intricate designs of the fuse. Crosley's contribution in the development of the Mark XIV gun sight also won high compliments from the services.

Your inquiries on electronic needs in design, development, production will have immediate, top-flight attention. Call, wire or write!

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CHAPTER NEWS

Atlanta

Highlighting the program of Atlanta's winter dinner meeting was a talk by George M. (Pup) Phillips, chairman of the metropolitan Atlanta civilian defense organization. Members sat on the edge of their chairs as Mr. Phillips spoke, harking back to the chapter's June meeting when Maj. Gen. William C. Chase, Third Army chief of staff, spoke on "The Situation in the Far East." Recalling that two weeks later the Korean situation broke in their laps, members felt that perhaps fate was being tempted by Mr. Phillips' talk on defense against atomic attack. The tenseness of the situation eased, it is reported, when calm still prevailed at adjournment.

Also featured on the program was Lt. Robert S. Malsby, a wounded veteran of the 24th Infantry Division. After reminding his audience of the late Ernie Pyle's famous remark that "a GI's war is only 50 yards wide," Lt. Malsby gave a report on the 50 yards of Korea that he had observed. This was followed by a showing of the now famous Army informational film on Korea, "The First Forty Days."

One hundred fifty-eight members of the chapter and their guests filled the Fort McPherson officers' mess to capacity. Special guests of the chapter were: Major General William C. Chase, Third Army chief of staff; Colonel Henry J. Hort, president of the Augusta-Camp Gordon AFCA Chapter, and Colonel R. P. Lyman, Third Army signal officer.

Rear Adm. Ellery W. Stone, USN (ret.), new president of the AFCA New York Chapter. A vice president of the IT&T Corp. since 1947, Adm. Stone has had a long and distinguished career in commercial communications and with the Navy in both World Wars. Since 1924 Adm. Stone has held highlevel executive positions with several communications companies. In WW II he served as chief of staff to Vice Adm. Wm. Glassford, USN, and after the Italian capitulation as deputy president and chief commissioner of the Allied Control Commission for Italy. He is a fellow of the I.R.E.; member of the Royal Society Arts (Eng.), member of the U. S. Naval Institute. He holds many decorations, United States and foreign.

Augusta-Camp Gordon

Augusta's third annual election took place at Camp Gordon on December 13th. Heading the slate of officers as president is Major Norman J. Kinley who did an outstanding job as chapter secretary during chapter's first year of existence. The other new officers are: 1st vice-president — Charles M. Eberhart; 2nd vice-president—Lt. Col. Randolph V. Fite; secretary-treasurer — Maj. Walter J. Hewitt. Col. Robert A. Willard and Hugh A. Fleming were chosen to represent the chapter on the National Council.

The following were elected to the board of directors: Thomas M. Baker, Lt. Col. Phillip Rose, Raymond E. Chandler, Lt. Col. William V. Norton, Henry A. Wright, Cpl. Richard A. Long, J. A. Harp, Lt. Col. Robert W. Harnett, Walter S. Williams, and Marion S. Symms.

Prior to the election of officers, Capt. John A. Ritner of Headquarters, Signal Corps Training Center, presented an interesting discussion of the local MARS station and the Camp Gordon Radio Club.

Father Bernard R. Hubbard, the "Glacier Priest," recently addressed the Philadelphia Chapter, highlighting photography and communications in Alaska. L to R: Chapter President H. A. Ehle; Father Hubbard; and W. W. Watts, National AFCA 1st vice president and director.

Chapter of the Year, 1950
AUGUSTA-CAMP GORDON
President—Henry J. Hort
Past Pres.—Hugh Fleming
Secretary—P. K. Jones

1951 Contest Chapter of the Year

As of December 31st the leading chapters in the current contest were:

Sacramento	17.1 points
Boston	15.0
Pittsburgh	14.9
Seattle	14.8
Philadelphia	14.7
San Francisco	12.8
New York	12.5
Augusta-Camp Gordon	12.1
Cleveland	11.8
Chicago	11.7

The contest now has three more months to go, ending on March 31st to coincide with AFCA's new fiscal year. The next quarter may bring a decided change in the above line-up. Sacramento strengthened its position in the lead during the month of December and it is interesting to note that the next four highest chapters are only a fraction of a point apart.

Baltimore

The Bendix Radio Division, Bendix Aviation Corp., was host to the Baltimore Chapter on December 5th at its Towson, Maryland, plant.

Special emphasis was placed on the vital question of civil defense with Paul Holland, director of public works, Baltimore City, and director of civil defense, Baltimore City, as the speaker of the evening.

Mr. Holland outlined the civil defense program for the city and stated that it is being covered in three big phases, namely: (1) educating the people as early as possible, (2) conducting trial runs and drills in fire fighting, first aid, communications, transportation, etc., and (3) the development of an organization of forty groups of civilian defense officers under the direction of a police sergeant in each of the forty areas. With communications being of utmost necessity, Mr. Holland requested the assistance of the Baltimore Chapter.

Amateur radio will play an important role in Baltimore's program, said Mr. Holland. The city will be divided into seven sectors—each sector having a complete transmitting station housed in a public building and operated solely by amateur radio operators. In addition, adequate underground communication facilities will be available to maintain contact between the stations at all times.

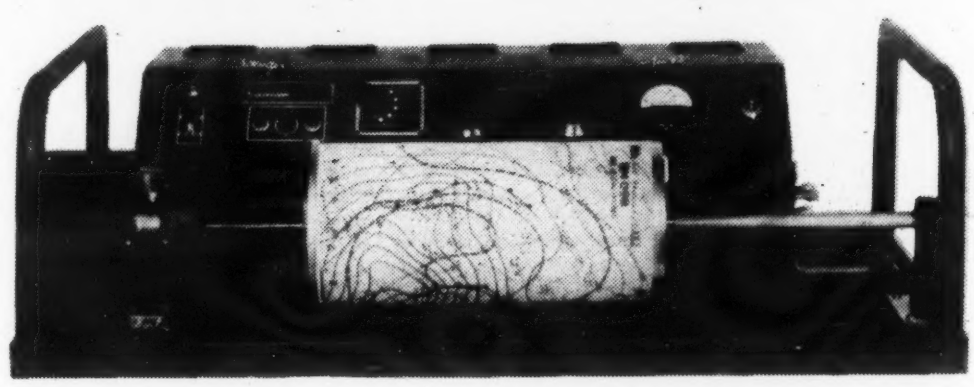
Col. George P. Dixon, AFCA Nation-

Now, more than ever,

FACSIMILE

is playing a vital part in communications

Model RG Recorder



Model TXC Transceiver

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CHAPTERS

National Director of Chapters: W. W. Watts, RCA Victor Div., Camden, N. J.

AREA REPRESENTATIVES FOR CHAPTERS

Area A: William H. Harrington, 195 Broadway, New York 7, N. Y. *New England States, New York, New Jersey*

Area B: J. H. LaBrum, Packard Building, Philadelphia, Pa. *Delaware, Kentucky, Maryland, Ohio, Pennsylvania, West Virginia and Virginia*

Area C: W. H. Mansfield, So. Bell T&T Co., Atlanta, Ga. *Southeastern States along Atlantic and Gulf coasts—from North Carolina to Louisiana including Tennessee*

Area D: Lury B. Redmond, 6106 Victor St., Dallas, Tex. *New Mexico, Texas, Oklahoma, Arkansas*

Area E: T. S. Gary, 1033 W. Van Buren St., Chicago, Ill. *Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Colorado*

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STUDENT CHAPTERS

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NEW YORK UNIVERSITY, New York, N. Y. President—William S. Furman, 225 Sedgwick Ave., New York 53, N. Y.

OKLAHOMA A & M COLLEGE, Stillwater, Okla.

STATE COLLEGE OF WASHINGTON, Pullman, Wash.

TEXAS TECHNOLOGICAL COLLEGE, Lubbock, Texas. President—Arthur Seybold; Secretary Frank N. Foster.

UNIVERSITY OF ALABAMA: President—Butler P. Hine, Jr., PO Box 5305, University, Ala. Secretary—Emory W. Morris, PO Box 3009, University, Ala.

UNIVERSITY OF CALIFORNIA, Berkeley, Calif.

UTAH STATE AGRICULTURAL COLLEGE: President—Marvin H. Stoneberg, 290 N. 2nd E., Logan, Utah. Secretary—George L. Beutler, 133 E. Center, Smithfield, Utah.

National Headquarters Chapters Secretary: Julia B. Godfrey

CHAPTER NEWS

al Executive Secretary, was a special guest of the chapter and reported on the overall progress of the association in its membership and advertising programs.

At the conclusion of the dinner meeting, chapter members and guests were conducted on a guided tour of inspection of the Bendix plant.

Boston

The chapter sponsored the Signal Corps exhibit, "The Signal Corps in Peace and War," at the First Cadet Armory, Boston, during the period December 12th-16th. Occupying some 6,000 square feet and attended by a unit of Signal Corps personnel, the exhibit depicts some of the outstanding developments of the era. This exhibit was first displayed at the AFCA national convention at Fort Monmouth last spring and has since been on tour in various parts of the country.

Invitations to attend the exhibit were sent to all communications and electronics companies in the Boston area by Chapter President Tom Halloran of the General Communication Company.

The chapter's December 21st meeting was devoted to an authoritative discussion of the communications phases of the civil defense program, with Professor William H. Radford, associate professor of electrical communications at the Massachusetts Institute of Technology and presently communications consultant for the Massachusetts State director of civil defense, as guest speaker. Professor Radford's talk on "Communications for Civil Defense" was most interesting and timely and was followed by a lively question and answer period.

President Halloran opened the meeting by introducing various guests which included Lt. Col. John Leidenheimer of the Office of the Chief Signal Officer, and representatives of civilian defense organizations from Cambridge, Newton, Wellesley and Needham, Mass., and representatives of the Massachusetts State Police. He also introduced Lt. Comdr. James E. Teague, asst. electronics officer, Boston Navy Yard, who had recently joined the chapter. Continuing the drive for increased membership, Adm. Halloran suggested that everyone present adopt the slogan "Every member bring in a member.

Capt. A. R. Taylor, USN, chairman of the chapter's communications committee, reported substantial progress in

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the committee's work with civilian defense organizations. Proposals for assistance in this work have been addressed to the civilian defense authorities in the States of Rhode Island and New Hampshire. The chapter's services had been offered to the State of Massachusetts early in the fall. A resolution was adopted unanimously that the Boston Chapter continue its efforts to assist in the establishment of communication facilities for civil defense.

Chicago

The Zenith Radio Corporation was host to the Chicago Chapter for its October 26th meeting. An instructive talk by J. E. Brown, asst. vice president and chief engineer of Zenith on "Zenith Operations in Peace and War" was followed by a guided tour of the Zenith plant facilities.

The evening's program closed with the showing of the film "Functional Photography in Industry," which has been made available to AFCA chapters through the courtesy of the Eastman Kodak Company.

Cleveland

The October meeting of the Cleveland Chapter consisted of an afternoon inspection tour of the wire drawing plant of the American Steel and Wire Company. Known as the Cuyahoga Works, the plant produces hot rolled rods, hot rolled strip, wire, cold rolled strip and strand. The tour covered some twenty-nine different highlights, such as the hot strip mill, the hot rod mill, the intricate processes of wire straightening, cutting, stranding and drawing, the multiple strand shearing machine, etc.

In November, in lieu of its regular monthly meeting, the chapter attended the AIEE sponsored meeting which featured Dr. J. O. Perrine, assistant vice president of the American Telephone and Telegraph Company, and his microwave demonstration lecture "More Words, More Waves, Less Wires."

Decatur

The election and installation of new officers took place at the chapter's December 7th meeting at the Decatur Signal Depot. The new slate is: president—Robert J. Bangert; 1st vice president—Lt. Col. J. N. Nahas; 2nd vice president—Capt. T. A. Mulcahy; secretary-treasurer — Willard Hayward; directors: Robert McMurtrey, Maj. A. W. Hazuda, David Richardson, W. R. Winn and George V. Miller.

Since the chapter had received a copy of the speech given by Major General S. B. Akin, Chief Signal Officer, before the Washington Chapter's meeting in October, it was decided that Chapter Secretary Edward C. Whitcomb would read the comments of the Chief Signal Officer to the members of the Decatur Chapter. The speech was extremely well received and at its close some discussion was held among the members regarding new equipments, with special interest being evidenced in the capabilities of the new Signal Corps wire.

A movie, made for the British Army and subsequently shown to the American troops, called "Fighting in the Streets," concluded the evening's program.

Boston Chapter views Signal Corps exhibit. L to R: Raymond B. Meader, chapter treasurer; Gardiner Greene; and chapter president Tom Halloran.

At Fort Monmouth Chapter meeting, L to R: Major C. G. Henline, Colonel Thomas H. Maddox, and Colonel Mitchell C. A. Carlsten.

Fort Monmouth

"Color" was the featured subject on the program of the Fort Monmouth Chapter meeting on December 7th. Ralph M. Evans, superintendent of the color control department of the Eastman Kodak Company, gave an excellent talk supplemented by 100 slides which proved many of the points of his lecture by dynamic demonstration. He was assisted in the demonstration by a number of AFCA members who are instructors in the photographic division, enlisted department, The Signal School.

The process of seeing is somewhat different from commonly accepted notions, Mr. Evans pointed out. Three sciences are involved in the understanding of its principles and characteristics: physics, physiology and psychophysics. After a brief review of the part played in vision of these differing types of action, the lecture was devoted to a carefully illustrated discussion of the way in which the mind interprets the information so received. A distinction was made between form and color vision and it was shown that for the most part what we see depends as much on ourselves and our experiences as on the external reality which the light presents to our eyes. The discussion then turned to the seeing of color and in particular to the seeing of colored objects. By an extensive series of pictures it was shown that seeing is largely a matter of recognition of objects with properties believed to be possessed by those objects and that the mind has the ability to see several things simultaneously at the same spot. As the best example of this it was shown how it is possible for a

Atlanta Chapter dinner meeting, Ft. McPherson officers' mess, L to R: R. J. (Snuffy) Smith, 3rd vice president; Col. Henry Hort, president, Augusta-Camp Gordon Chapter; Maj. Gen. William C. Chase, deputy CG, Third Army; Ralph S. Grist, president, Atlanta Chapter, and Lt. Robert S. Malsby.

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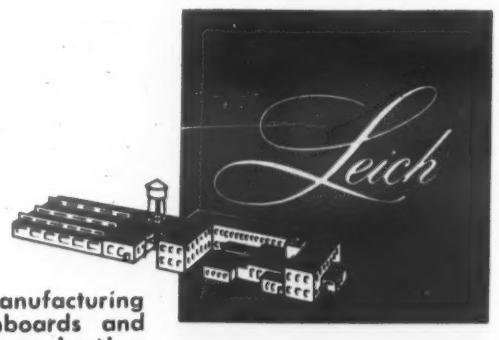

Leich has been manufacturing telephones, switchboards and associated communication equipment since 1907. The combination wall and desk telephone, and many other improvements in modern telephony are Leich developments.

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Fort Monmouth Chapter meeting at Gibbs Hall, Fort Monmouth, N. J. L to R: Lloyd F. Christianson, president of Electronic Associates; Lt. Col. N. L. Chamberlain, assistant chief of the enlisted dept., TSS; Mrs. N. L. Chamberlain; Col. J. N. Purcell, director of the enlisted dept., the Signal School; Capt. D. M. Uhler, Signal Corps Board; and Henry M. Neri, military instructor of instructor techniques, training division, the Signal School.

CHAPTER NEWS

person to see simultaneously objects illuminated by light of a certain color and at the same time see the true colors of the objectives themselves.

The chapter's annual elections were held with Col. E. A. Kenny selected as the new president; L. F. Christianson, 1st vice president; Philip T. Boone, 2nd vice president; Lt. Col. Mervin C. Bowers, sec.; Esther M. Fernau, treasurer.

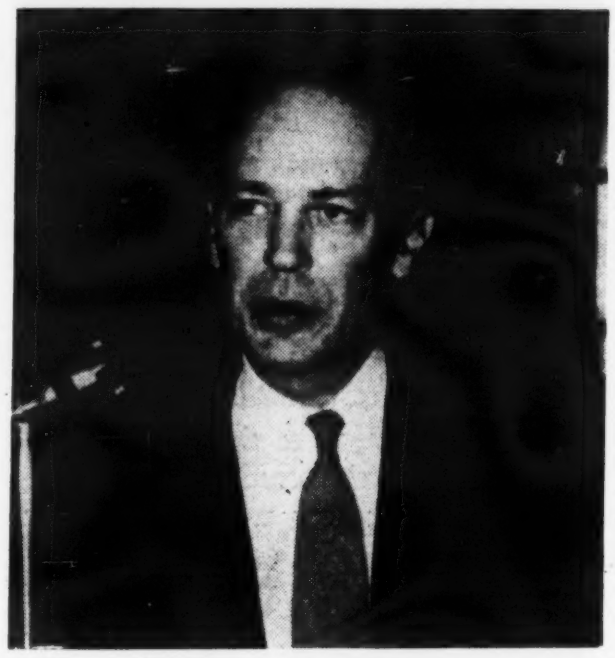
Much credit must be given Col. Jim O'Connell, past president, and Lt. Col. Huston Maxwell, past secretary, for the excellent condition of the chapter.

New York

Civil defense was given top billing on the program of New York's December 13th meeting with Robert R. Burton, director, civil defense communications of the National Security Resources Board, as the principal speaker. Mr. Burton told of his experiences while attending international radio conferences as a representative of the State Department "Voice of America." He outlined many of the problems confronting civil defense and stressed the important role that communications will play in each community's civil defense organization.

A demonstration of the "Alert Radio Signaling System" was given by Comdr. Arthur F. Van Wyck of RCA's engineering staff. He showed that a simple device employing a "tuned reed" could be connected to any broadcast receiver to permit civil defense officials to receive air raid alerts or other warnings. An inaudible warning tone signal would be transmitted by the local broadcast station and would cause a lamp to light and a bell to ring in the device associated with the broadcast receiver. An actual demonstration of this alert system was given through the facilities of station WNBC.

The chapter's annual elections brought in the following slate of officers for the year 1951: president—Rear Admiral Ellery W. Stone, president of American Radio & Cable Corp.; vice-presidents—Col. Theodore L. Bartlett of RCA; Herbert J. Schroll, New York Telephone Co.; Col. Hobart R. Yeager, USAF, Mitchell Field; treasurer—Maj. Theodore W. Pope, Bell Labs; secretary—Lt. Col. David Talley, IT&T Corp.



Dr. Ralph M. Evans, head of Eastman Kodak's color control department, delivering address on color and characteristics of light, as pertains to color photography, at Ft. Monmouth meeting.

The board of directors are: Vice Admiral W. S. Anderson, International Automatic Electric Co.; George W. Bailey, IRE; Brig. Gen. C. O. Bickelhaupt, AT&T; Commodore J. B. Dow, Hazeltine Electronics Co.; Lt. Col. W. L. Hallahan, Laird & Co.; Col. W. H. Harrington, AT&T; Maj. Gen. Harry C. Ingles, RCA Communications; Fred R. Lack, Western Electric; Brig. Gen. A. W. Marriner, IT&T; Col. T. H. Mitchell, RCA Communications; Rear Adm. S. F. Patten, Allen B. DuMont Labs.; Col. Van Ness Philip, AUS (Ret.); Maj. W. H. Rivers, Eastman Kodak; Lt. Col. E. R. Shute, Western Union; Col. Morton Sultzer, Bell Labs.; Brig. Gen. S. M. Thomas, RCA Communications.

Philadelphia

Father Bernard R. Hubbard, "The Glacier Priest," author, explorer and photographer, who has just returned from Alaska where he is serving as chaplain to the 10th Rescue Squadron, addressed a record audience of 500 at the Philadelphia Chapter meeting on November 16th.

"Bering Sea Patrol," the title of Father Hubbard's illustrated lecture, highlighted photography and communications in the strategic Alaskan Peninsula. Not only did he present some breath-taking pictures of disintegrating glaciers and ice flows, but also a first-hand account of the work that has been done and is being done by the U. S. Air Forces in that area.

Of tremendous interest to all was Father Hubbard's statement, based on 25 years experience in the far North, that due to the geological layout of the country and the necessity for having to support troops over a 1,000 mile supply line through the worst flying weather in the world, it would be impossible for an enemy to ever use Alaska as a springboard for invasion of the U. S.

While the major part of Father Hubbard's lecture was confined to Alaska, he also presented some interesting views regarding the European and Korean situations.

Guest of the chapter for the evening were members of the American Ordnance Association, 9555th ORTSU, Naval Aviation Supply Depot, Frankfort

Georgia School of Technology Chapter. In front row are, L to R: Col. R. P. Lyman, chief signal officer, Third Army; Lt. Col. Donald L. Adams, section head of Georgia Tech's Signal unit; John F. Harte, president of the Tech AFCA chapter, and a vice president of the AFCA Atlanta Chapter; and Maj. George O. Baldwin, assistant section head of Georgia Tech's signal section.

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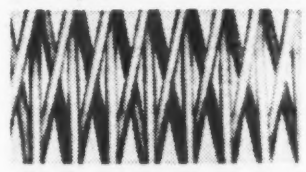

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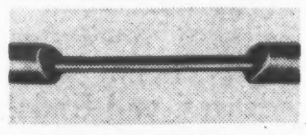

Section of KOOLOHM wire with ceramic insulation removed to show contrast between bare and insulated wire. This flexible, heat-proof insulation is actually applied to the wire at a temperature of 1000°C.

CHAPTER NEWS

Arsenal, Reserve Officers' Association, and the Quartermaster Depot Officers' Club. Chapter President Harry Ehle, of International Resistance Co., opened the meeting with a word of welcome to the chapter guests and outlined the purpose and function of the AFCA.

Pittsburgh

The Copperweld Steel Company, Glassport, Pa., was host to the Pittsburgh Chapter for its dinner-meeting on November 14th.

After a turkey dinner in the Copperweld dining room, the AFCA members and guests were divided into groups of five to seven and conducted on a two-hour tour of the plant which manufactures copper covered wire products ranging from nails to all sizes of power and telephone wire. The tour was most thorough, following the processes of making Copperweld products from the casting department through to the shipping room.

Rochester

The United States is way ahead in the field of military photography, Edward K. Kaprelian, chief of the Army Signal Corps photographic section, Fort Monmouth, said while addressing the organizational meeting of the Rochester Chapter on December 13th. He described a few of the photographic and optical devices being developed at the Signal Corps engineering laboratory to sharpen America's military eyes, and related some of the achievements of the Rochester photographic industry in recent developments.

Mr. Kaprelian showed on a screen a picture of a crude 120-inch German camera used in World War II for photographing the coast of England, then in contrast a compact extension camera made by Eastman Kodak Company which he said far exceeded the effectiveness of the earlier one. A 70 mm. combat camera made by Graflex he declared is slated to replace all other frontline cameras. He also showed a medical camera made by Graflex which he characterized as outstanding in this field. Lenses manufactured by Wollensak Optical Company surpass in quality those formerly made in Germany, he said, and added that Ilex shutters are highly important for military use. Mr. Kaprelian emphasized the value of Xerography research at the Haloid Company for particular needs of the armed forces, and also paid tribute to lens research at the Hawk-eye plant of Eastman Kodak citing in particular a 100-inch infra red lens.

The University of Rochester, stated Mr. Kaprelian, is doing research on variable focus lenses, and Kodak on the recovery and reuse of photographic compounds, regarded as highly important under combat conditions.

The speaker also showed pictures of batteryless flash-holders, electronic shutter holders, special sound projectors, a 2,000-watt lamp operating without electricity, a field photographic processing machine that operates at the rate of 45 feet per minute, and an electric camera requiring no film.

Fort Monmouth Chapter meeting, L to R: Col. W. A. Beasley, D/C of Signal Corps Engineering Labs; Dr. Ralph M. Evans, head of Kodak color control dept., and principal speaker at the meeting; Col. E. A. Kenny, director of the officers' dept., the Signal School, and newly elected president of the Ft. Monmouth Chapter; Col. J. N. Purcell, director of the enlisted dept., the Signal School; and Mr. Marshall, chief of the training division of the Signal School.

Mr. Kaprelian emphasized that the Korean war has re-established the vast importance of photo-reconnaissance work. "Without photography it would have been impossible to move anywhere in Korea," he said.

AFCA Executive Secretary George Dixon emphasized the objectives of the association and formally launched the new AFCA unit by presenting the charter of the Rochester Chapter to Joseph C. Wilson, president of the Haloid Company, who is acting president of the chapter. Mr. Wilson named a nominating committee for chapter officers as follows: Rufus R. Rosenbloom, president of Ilex Optical Co.; Edward A. Springer, president of Wollensak Optical Co.; and Kenneth E. Reynolds, manager of the special government department of Bausch & Lomb Optical Co.

Among those attending the meeting at the Chamber of Commerce were representatives from Eastman Kodak, Graflex, Haloid, Bausch & Lomb, Stromberg-Carlson, Wollensak and Ilex Optical companies, and DuPont.

Sacramento

A description of "Electrical Power and Communications in the Korean Picture" was presented to the Sacramento Chapter meeting on December 12th by George A. Fleming, chief, power and resources development division, U. S. Bureau of Reclamation, Sacramento. Mr. Fleming illustrated his talk most effectively with color film and slides which he had taken on a recent trip to Korea where he was making a survey of power and communication facilities.

The meeting was opened by Chapter President Paul Carrington with a word of welcome to the members and guests. He then presented an outline of the part to be played by the chapter in the Sacramento disaster relief plan. Major X. W. Godfrey was appointed chairman of the committee to cooperate with the communications committee of the disaster relief council.

San Francisco

The aeronautical communications functions of an international airline company were described by Mr. D. E. Axe, superintendent of communications, Pacific Alaska Division, Pan American Airways, before a meeting of the chapter on November 16th.

Mr. Axe, who has travelled extensively for his company, related some of the many interesting experiences and problems with which he has been confronted in establishing the extensive world wide communications system necessary for the successful operation of Pan American Airways. Of special interest were his reports of the operation of the radio telephone networks which have replaced radio telegraph for Pan American. The lively question and answer period which followed was indicative of the interest aroused by the speaker's excellent talk.

A Signal Corps film showing combat scenes of the Korean action concluded the evening's program.

Seattle

An interesting insight into Japanese history was given in a talk on "Far East Customs and Habits" by Major John D. Flewelling of the Alaska Communications System before the chapter's November 8th meeting.

Major Flewelling pointed out that the Japanese attitude has changed greatly since 1945 because under the occupation they have found freedom and individuality, and that the freedom educational program was accomplished quickly due to the extensive radio nets and newspapers. He also stated that the Japanese electronic technicians, despite the handicaps of shortages of essential materials, do an excellent job but lack the know-how for efficient production.

Special guests of the chapter were representatives of the U. S. Navy. Membership Chairman Frank Keyser wel-

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comed them to the meeting and introduced each one individually to the AFCA members.

The election of new officers for the ensuing year was the main item of business at the December 13th meeting held in the Seattle Chamber of Commerce building. The following slate was chosen: president — Marshall B. James, Northwestern Agencies, Inc.; 1st vice-president — Frank D. Keyser, Pan American Radio; 2nd vice-president—Lee David, National Film Production Co.; secretary—Merrill R. Stiles, Alaska Communications System; treasurer—Joe E. Gregory, re-elected for a second term. Chapter directors are: Col. Fred P. Andrews, Lt. Col. Clarence D. Lawrence, Phil Duryea and John F. Rozanski.

It was announced that Major William F. Devin of Seattle has appointed retiring Chapter President Clarence D. Lawrence chairman of the communications committee of the Seattle Civil Defense Commission. Col. Lawrence has been active in the civil defense program since its inception. The chapter reports that it is extremely proud of the active participation of its members in the communications field of the defense work and that frequently there comes to light the professional, technical and supplier aid that its members are furnishing the armed forces and defense organizations.

Admiral Stanford Hooper's "First Team" of radio pioneers at Washington Chapter meeting. (Story in Nov.-Dec. 1950 issue). Seated, L to R: R. E. Gillmor; Comdr. T. A. M. Craven, USN; Rear Adm. Stanford Hooper, USN, ret; Charles S. Range; and Morris E. Eason. Standing, L to R: Capt. R. A. Lavender, USN; Capt. Wm. A. Eaton, USN, ret.; Como. E. K. Jett; Arthur O'Brien; Lloyd S Quynn; and Capt. C. H. Maddox, USN, ret.

Washington

The 1950-51 season for the Washington Chapter, inspirited by the imaginative planning and vigorius follow-through of President Francis H. Engel, program committee chairman Percy Black, and assistant secretary W. P. Dutton, continued in its series of outstanding meetings when it brought before the chapter's January 12th meeting National Production Authority Assistant Administrator H. B. McCoy for a discussion on NPA Policies-Program.

The chapter luncheon-meeting was held, as have been all previous current season meetings, at the National Press Club in Washington.

The chapter members and guests, following the meeting, expressed the feeling that Mr. McCoy's address regarding the policies and programs of the NPA, in the past few months, and for the present and for the future outlook in allocations and controls orders, was extremely succinct and informative.

Before the chapter audience of about 300, Mr. McCoy cited that the recent copper order prohibiting non-essential uses by manufacturers of the critically short "red-metal" would be followed soon by prohibition orders of a similar type in other critical materials.

Mr. McCoy urged both manufacturers and communications companies to stress conservation of critical metals. Equipment manufacturers, he said, should reexamine their specifications for civilian apparatus to assertain if alloys of critical materials or substitute metals can be utilized. The Defense Mobilization Directorate is establishing an interdepartmental conservation committee to inquire into and study the entire situation, he said.

The NPA realized that it cannot reduce the supply of copper allocations to essential users on a basis of 50 percent of the base period of the first half of 1950, Mr. McCoy said, because it would be extremely injurious to the proper operation of the communications industry. "Certain industries, like the communications services cannot operate below the level of safety," the NPA assistant administrator stated. "Communications must have adequate supplies of materials for maintenance and repair an dalso for additional facilities at the minimum level needed to serve and assist the defense effort. This is why the NPA recognizes the essentiality of services like the telephone and telegraph."

The emphasis os on increasing the raw material mining supplies, in production efforts, Mr. McCoy told the AFCA audience, but "the outlook is very discouraging" for any substantian increase in the supply of the critical metals in the United States, especially of copper, nickel, and cobalt, for the next three or four years. "We have got to live with what we have, for some time," he stated. The controlled materials plan of the wartime War Production Board, Mr. McCoy indicated, was being studied by NPA, but he pointed out that the CMP, soon after it was activate, created inflation in priorities. He warned that there will be increasing controls on materials and in allocations.

Several staff members of the National Production Authority also attended the Washington Chapter meeting, and were seated at the speakers' table with Mr. McCoy. The group included John G. Daley, chief of the electronics division; Brigadier General C. H. Arnold, (USA, ret.), former Signal Corps chief of procurement and distribution, and now chief of the NPA communications division; Donald Parris, assistant chief of the electronics division; Edward Bowman, administrative assistant to Mr. McCoy; and W. Walter Watts, newly appointed aide to DPA director Harrison. At the time of the Washington Chapter meeting Mr. Watts had just arrived in Washington to take up his new post. An RCA Victor vice president, he is on leave from that company for an indefinite period to handle his government assignment. He is also an AFCA vice president and national director. (*See photo, page* 30)

Part of Washington Chapter luncheon-meeting group which heard address by Rear Adm. Stanford C. Hooper, USN, ret.

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NEWS–SERVICES and INDUSTRY

communications - electronics - photography

Armed Forces Procurement Contracts Now Coming In Volume

Policy Board in Final Meetings

The final meetings of the President's temporary communications policy board, before its much-awaited report and recommendations were to be submitted to the White House, took place February 11-12-13. The report and recommendations were to be submitted to President Truman on February 16th. it was expected, but the plan to hold up all releasing to the press and public of the report until it has been printed would delay public knowledge of the details for several weeks.

Photo Committee Meets with NPA

Members of the photographic apparatus and equipment industry advisory committee met recently with National Production Authority officials to discuss problems facing the industry in view of the virtual certainty of critical metals supply curtailment, and to weigh possible methods of conserving and substituting for light metals used in making cameras and other photographic equipment and accessories.

Industry representatives pointed out that their need for aluminum and other light metals is greater than the supply permitted under the base period included in recent NPA orders. Committee members felt that the base period selected worked to their detriment since it was their most unproductive period in the last few years. NPA officials said they would take this matter under consideration.

Representatives voiced the hope that the industry would be supplied defense contracts which would utilize the skilled labor supply they now employ. Otherwise, they warned, their skilled workers would drift off into other forms of employment and they would be faced with the prospect of too few trained workers in the event of an all-out production effort.

AFCA member firms represented at the meeting were Eastman Kodak Co., Argus Mfg. Co., Wollensak Optical Co., Federal Mfg. and Engr. Corp., Weston Electrical Instrument Corp., and Graflex, Inc.

Silver Sensitized Goods Committee

The day following the photographic meeting members of the Silver Sensitized Goods Industry Advisory Committee also met with NPA officials to discuss the position of their industry in the rearmament effort.

Industry representatives said that NPA orders have not yet affected their

Air Force Has Lined Up Virtually All Supply Sources

DPA Organizational Setup In Final Stages of Approval

With the procurement contracts of the three armed services commencing to roll out in volume in the communications and electronics-radio fields, the mobilization machinery of the country, through the office of War Mobilization, headed by former General Electric Co. President Charles E. Wilson, and the Defense Production Administration, with Maj. Gen. W. H. Harrison as chieftain, has been completing its planning through a continuous round of conferences with the leadership of the Department of Defense and top figures in America's industrial field.

Communications-electronic procurement letter orders to activate contracts totaling approximately $500 million have been issued by the Signal Corps, with the manufacturing companies authorized to proceed with the manufacture of approximately 300 different items, it was announced January 30 by the Signal Corps. The telephone and wire communications manufacturing industries have received more than half of the total orders, and it was cited that the issuance of these letter orders had been achieved by a concerted effort with much overtime during the first three weeks in January. Because of industrial preparedness planning of the Signal Corps since the close of World War II, prompt placement of the letter orders was possible.

The Air Force Materiel Command at the Wright-Patterson Air Base in Dayton, Ohio., expects to complete a goal of the issuance of definitive and immediate-production contracts by March 1 of the total amount of the funds available for electronics and radio equipment procurement, totaling $854 million. It was understood that at least 95% of the $854 million, which constitutes the funds made available in the original Department of Defense appropriations bill for current fiscal year and the two supplemental appropriations measures, would be obligated by that date.

The Air Force has been intensively surveying all available manufacturers which are competent and have engineering know-how and can comply with firm delivery dates. It is understood that the Air Force has now lined up virtually all of such manufacturing sources of supply, including a large number of new manufacturers that have not so far engaged in military procurement. It was stressed by authoritative Air Force sources that accelerated deliveries of airplanes by the aircraft manufacturing companies must mean and be accompanied by accelerated production and delivery of electronics and radio equipments to place the new airplanes in immediate operation.

The new organizational setup of the Defense Production Administration is in the final stages of formal governmental approval especially by the Bureau of the Budget, and may be announced publicly soon. In reality, the DPA organizational setup public announcement is not especially significant, since General Harrison's organization has been functioning with increasing effectiveness and efficiency, and certainly is by no means in any state of confusion, such as is existing now in the new price control and wage stabilization agencies. The DPA organization announcement might possibly have substantial significance in the delineation of the future role of the National Production Authority.

The NPA communications division, which is now headed by Brig. Gen. C. H. Arnold, retired procurement and distribution chief of the Signal Corps, sent out invitations in early February to prospective members of its new domestic telephone and telegraph operating industry advisory committee, embracing the Bell System, the Independent branch of the telephone industry, and the Western Union Telegraph Co., for its first meeting to be held in Washington, tentatively set for February 20. The communications division still has not yet organized its staff because of the crowded space limitations, but has been functioning in the laying of the groundwork for its future activities.

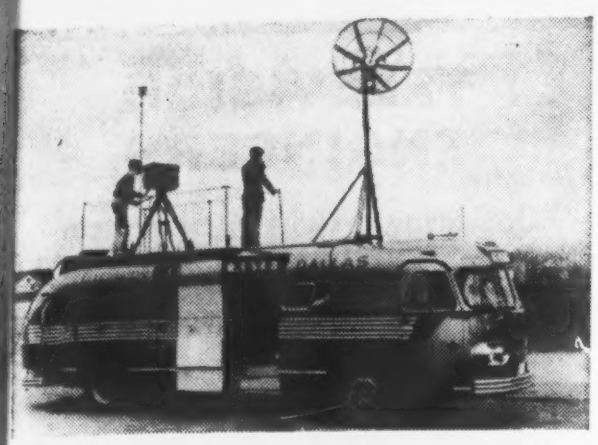
The NPA electronics products division, headed by John G. Daley, with Donald Parris as deputy director, was due to move to larger quarters in the same building where it is now located, and this will enable Mr. Daley and his

(*Continued on page* 52, *col.* 2, 3)

THIS DEPARTMENT'S PRINCIPAL SOURCE

Telecommunications Reports

Roland C. Davies, Editor
National Press Building
Washington, D. C.



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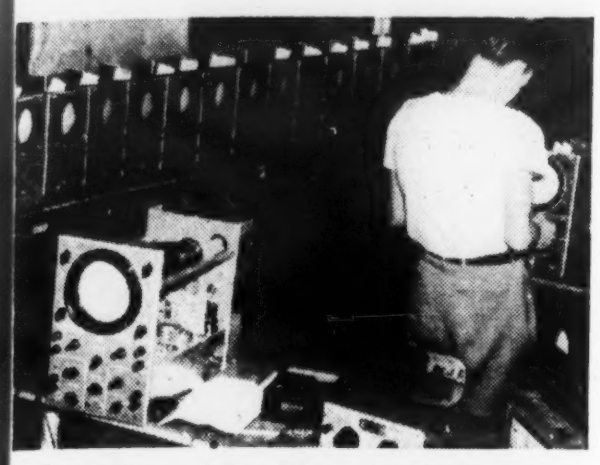

A number of Du Mont Cathode Ray Oscillographs moving through test position after production in the Clifton Plant. Du Mont is the world's largest manufacturer of this type of scientific equipment.

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Du Mont Engineer conducting final tests, prior to installation, of Du Mont 5 KW Air-Cooled Transmitter, Series 7000/8000, at Du Mont's Clifton Plant.

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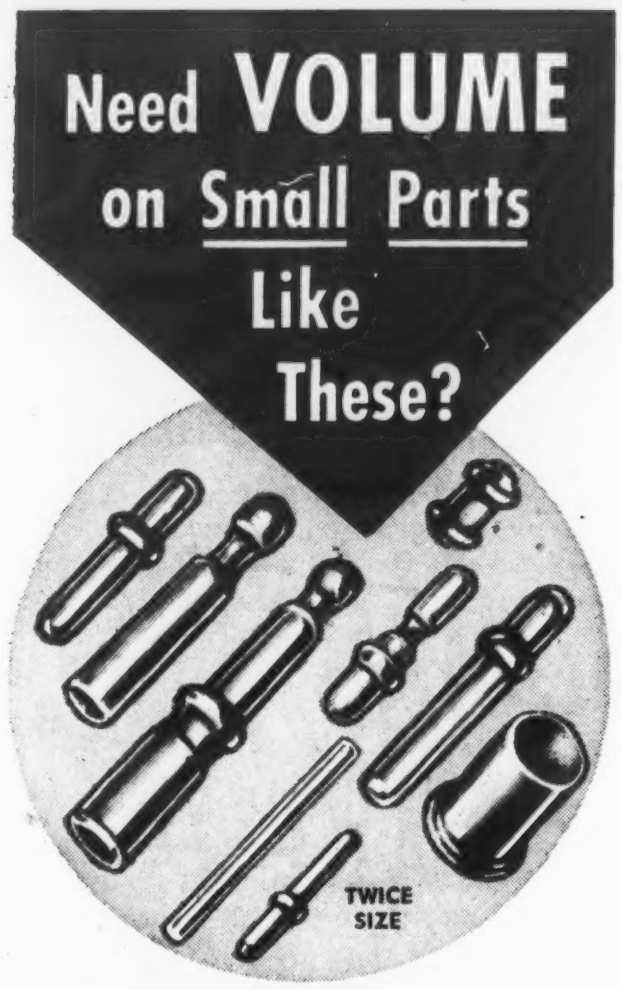

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production seriously, but they were concerned over the possibility that future orders might. They emphasized that their industry is already operating at virtually full capacity and that they must know in advance what military needs will be in order to plan for possible plant expansion. Any major expansion, they said, would probably require two or more years to carry out.

Metal Shortage Forecast

NPA's McCoy Foresees No Increase Soon

The National Production Authority program includes plans for increasing the raw material mining supplies of copper, nickel, and cobalt, NPA assistant administrator H. B. McCoy stated, in an address before a meeting of the AFCA's Washington Chapter, January 12, but "the outlook is very discouraging" for substantial increases in the production of these critical metals for the next three or four years.

Mr. McCoy urged both manufacturers and communications companies to stress conservation of critical metals. Equipment manufacturers should re-examine their specifications for civilian apparatus to ascertain if alloys of critical materials or substitute metals can be utilized, he said.

(See "Washington Chapter" for further account of meeting—page 44).

Ingles Addresses N.Y. AFCA

Stresses Potential of Commercial System

Renewing his emphasis on the importance of commercial international communications companies to the nation's defense effort, Major General H. C. Ingles (ret.), president of RCA Communications, declared in a talk before the AFCA's New York Chapter that, "It is a matter of daily regret to me that I did not know, when I was Chief Signal Officer of the Army, what I know now about what can be done with American international telegraph facilities."

General Ingles said he could have saved the government considerable money and time if he had had "a proper appreciation of the extent and flexibility of the commercial system during World War II." He said the nation should have a joint committee of the armed forces and representatives of the domestic and international communications companies to plan mobilization of the country's facilities.

At the AFCA New York Chapter meeting Brigadier General A. W. Marriner (USAF, ret.), director of aviation of the IT&T Corp., also spoke, discussing the increasing complexity of electronic equipment for war use. He said the amount of money required is "stupendous," but that an even greater problem is the obtaining and training of competent personnel to operate and maintain the equipment.

Rear Admiral Ellery W. Stone, president of the American Cable & Radio Corp., and of the AFCA New York Chapter (see "Chapter News," page 34, this issue) presided over the discussion of "Communications Resources of the Free World."

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Near $28 Million Contracts in Week

Armed Forces Communication-Electronics Awards

The weekly list of armed forces procurement contract awards announced by the Department of Commerce February 7th included a total of $27,777,477 in contracts signed with manufacturers throughout the United States for military communications and electronics equipment. The Signal Corps came in for the bulk of the contracts, awarding a total of contracts for $23,72,643.

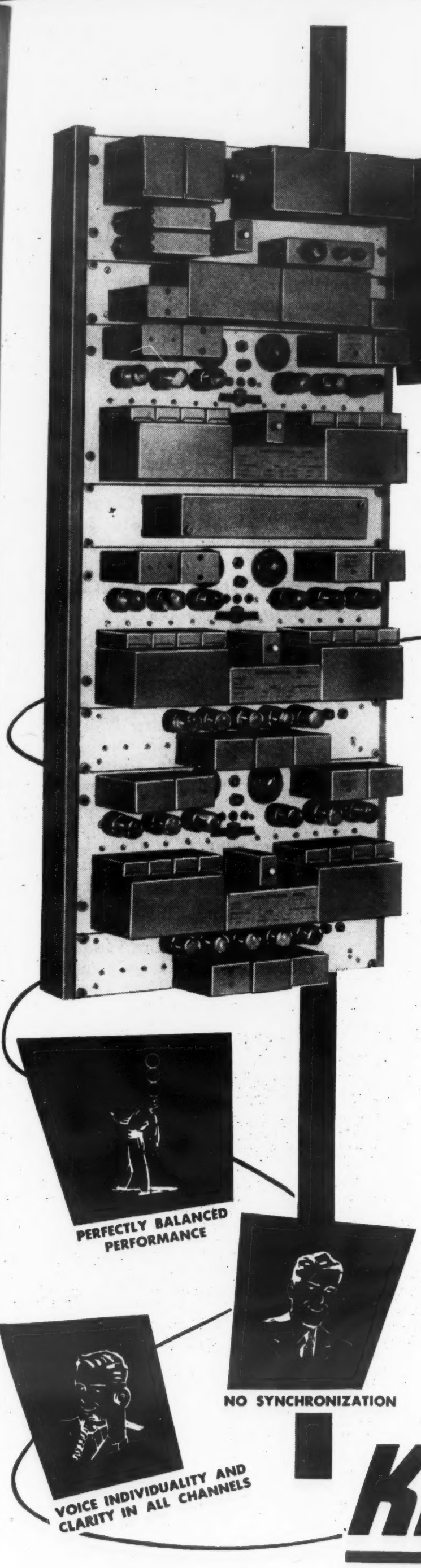
Radar Air Defense Exercise

A four-day training exercise of radar and fighter-interceptor aircraft units of the air defense system in the northeast, Great Lakes, and Middle Atlantic section of the United States got under way February 8. Designed to provide the maximum training for all air defense elements the exercise called for the flight of the aircraft over prearranged routes, and the tracking of the aircraft by 19 filter centers in the area by radar observation and reports telephoned in by civilian volunteers at observer posts.

Photogrammetry Society Exhibits

Among exhibits at the annual meeting of the American Society of Photogrammetry in January, at Washington, D. C., was a new identification camera developed jointly by the Polaroid and the Fairchild Camera and Instrument Corp. With the new camera, demonstrated at the meeting for the first time, identity photos in less than sixty seconds are possible to provide wartime identification for personnel in plants, offices, and military installations.

Other products on display at the meeting were the T-11 mapping camera (exhibited by the Air Force), a new data-recording camera for photographing the instrument panels of planes



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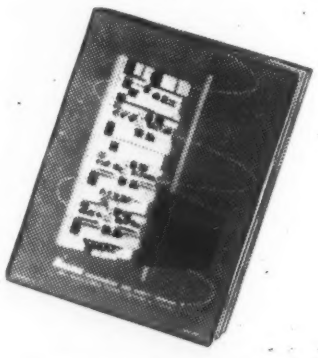

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during speed and diving tests, the latest model cartographic camera for civil use, a new high-speed shockless draw-type shutter, and the standard map plotting accessories, including the stereocomparigraph, and the self-contained pocket stereoscope.

The new identification camera, developed since the outbreak of the Korean war, will afford faster processing of new employees, according to officials of Fairchild. Said one, "this camera was developed to enable identification pictures to be made for immediate use and thus provide a degree of security never before possible.

Automatic Microfilm Recorder

Photography and electronics were combined in the development of a new microfilm recorder which is so completely automatic in its operation that it is possible for an operator who never took a picture in his life to become an expert just by pressing a button.

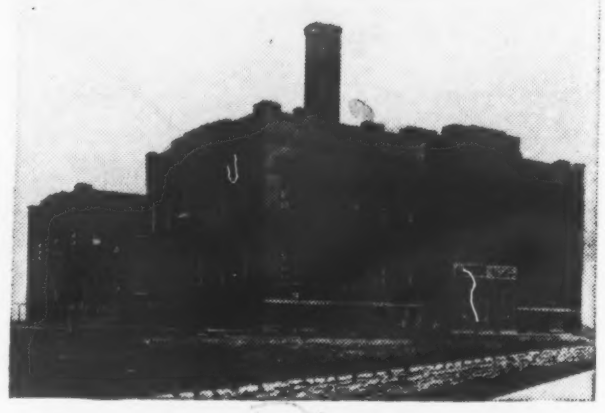
The recorder, made by the Bell & Howell Co., automatically takes care of lens opening and shutter speed. Lighting and film rating are perfect, so that the operator doesn't need to be concerned about them. Electricity is kept under control by a device made by the Sola Electric Co.

Key to the success of the apparatus is synchronizing the camera's shutter action with the movement of items to be photographed. The system operates three elements which must be in perfect coordination. They are the motor, which revolves a roller over which the documents must pass; a light which illuminates the items being photographed; and an electric clutch, which synchronizes camera speed with the speed of the documents passing through the recorder, and insures that each one is opposite the lens at the moment its picture is snapped.

Photos are taken on a 100-foot roll of 16 millimeter film. Front and back pictures of 400 checks can be taken in one minute. The recorder can photograph paper up to nine and one-half inches wide with automatic feed, and 11 inches with hand feed. There is no limit to length.

Combat News Coverage Studied

Way and means of insuring improved communications transmissions of press and broadcasting news information from combat zones in future overseas military operations—should such develop—were discussed and studied at an all-day conference, February 5, at the Pentagon by representatives of the Army Chief of Information, the Army Signal Corps, Naval Communications, the Air Force Directorate of communications, the press associations, broadcasting networks, and the commercial international communications companies.



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NAVY

Navy Develops New Amplifier

The Naval Research Laboratory has announced the development of a self-contained, single-package amplifier for general microwave antenna "and network" measurements in conjunction with bolometer or crystal detectors. The laboratory said the amplifier has a continuously tunable frequency range of 400 to 5000 cycles, "with calibration accuracy of plus or minus five percent."

Navy Communications Tops at Hungnam

The evacuation of the American troops from northern Korea by the U. S. Navy at Hungnam not only was one of the most magnificent military accomplishments of the Korean war—and in no sense a "Dunkirk"—but demonstrated the value of the communication techniques perfected by the Navy for amphibious landing operations during World War II. In effect, the Hungnam evacuation was a massive landing operation in reverse.

Naval communications provided continuous contact between the force commander of the fleet at Hungnam and his subordinates and the ships and landing craft for the orderly timing and progress of the evacuation. Voice radio communication with units ashore made possible rapid dockings and the loading of ships with a minimum of confusion.

Communications, in addition, played a primary role in the control and direction of naval gunfire support and air bombing and strafing support which was so effective against the communist Chinese and North Korean forces. Effective communications between Naval forces and units of the Army and Air Force produced the coordination which assured the success of the evacuation.

One of the notable features of the evacuation was the loading aboard the naval craft of the huge amounts of equipment which the Army and Marine Corps troops brought back in their withdrawals from the interior mountain fastnesses of northern Korea. It was deemed certain that the major portion of the vital apparatus of the Signal Corps used by the Army forces was evacuated. The 10th Corps, particularly, was most successful in salvaging its equipment.

PERSONNEL CHANGES

Ammon Rank Approved

Rear Admiral William B. Ammon, assistant director of Naval Communications since June 1948, and very highly regarded for his ability, was confirmed by the Senate January 25th for his promotion to the flag rank. Shortly following the Senate approval action Admiral Ammon was assigned to sea duty in the Pacific in command of Destroyer Flotilla 3. His date of rank as a rear admiral is from 1 January 1951.

Col. Vadnais Liaison in OCNO

Colonel H. W. G. Vadnais, who served as Marine Corps signal officer for the Fifth Amphibious Corps in the Iwo Jima Operation and on the Pacific Fleet's amphibious force staff during World War II, has been assigned as Marine Corps liaison officer in the Naval communications division of the Office of the Chief of Naval Operations. Since the last war, Colonel Vadnais, who graduated from the U. S. Naval Academy in 1934, has been Marine Corps liaison officer at the Signal Corps schools in Fort Monmouth, N. J.

Goulett New Assistant Director

Captain W. B. Goulett, USN, who has been head of the operations and planning branch in the division of Naval Communications, relieved Rear Admiral W. B. Ammon on February 9th as assistant director of Naval Communications, under Rear Admiral John R. Redman, the Director.

The new assistant director of Naval Communications has had communications-electronics duties at sea as radio officer of a battleship division and a battle force, as fleet radio officer, and as radio and electronics officer on the staff of the commander-in-chief of the

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RELAYS SWITCHES

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Pacific Fleet. In the communications-electronics field his tours of duty have included those of electronics officer representative at the Naval Research Laboratory and with the electronics division in the Office of Chief of Naval Operations.

Captain Goulett graduated from the Naval Academy in 1925. He took an M.S. degree from Yale University, following which he served as radio officer of the U.S.S. Indianapolis, radio officer of Staff Battleship Division 2, and radio officer of the Battle Force. He is a graduate of the senior course at the Naval War College at Newport, R. I.

Hull Becomes Raytheon V.P.

AFCA Director David R. Hull (Captain, USN, Ret.) was recently elected a vice president of the Raytheon Manufacturing Company, Waltham, Massachusetts. Formerly assistant manager of the equipment division of Raytheon, Capt. Hull became manager on the first day of this year.

At the time of his retirement from the Navy Capt. Hull was assistant chief of the Bureau of Ships for electronics. Before joining Raytheon in May of 1949 he had been executive vice president and director of the Capehart-Farnsworth Corp, a vice president and director of Federal Telecommunications Laboratories, and assistant technical director of the IT&T Corp.

A 1925 graduate of the U. S. Naval Academy, Capt. Hull early specialized in underwater sound and radar development. In 1940 he was designated an engineering duty officer. He had received an MS degree from Harvard University in 1933.

When the U. S. entered World War II Capt. Hull was serving as assistant to the director of the Naval Research Laboratory. He was transferred to the Bureau of Ships as head of the electronics design branch, was soon advanced to deputy for electronics, and finally was assigned to the top Navy electronics post, which carried the responsibility for the design, procurement, installations, and maintenance of all Navy electronic equipment. For his services he was awarded the Legion of Merit and the Navy Commendation Ribbon.

AIR FORCE

AACS Doing Fine Job in Korea

The Airways and Air Communications System, commanded by Brig. Gen. Wallace G. Smith, with its relatively small numerical strength of 15,000 scattered throughout the globe, like all other American military units in the Korean fighting has been performing a magnificent job. Illustrative of the round-the-clock efforts of the AACS in the Korean campaign, there are seven AACS circuits maintained from Hickam Field, Hawaii, to Tokyo, and during November one circuit passed along 689,324 groups and another was responsible for 239,296. Total messages during the month on one circuit alone was 5918, and on another was 5149.

Undoubtedly in the air lift activities, where wounded and survivors were brought away to safety, the AACS control stations have been all-important cogs in the operation, with the AACS personnel right in the thick of the fighting. Mobile AACS radio apparatus is landed in cargo planes used in these lifts, or the radio equipment on mobile units of the Army and Marine Corps can be used in such air control operations.

Helicopter Automatic Pilot

A new combination automatic pilot and stabilizing device for helicopters, developed through the combined research of the Air Force, Navy, and Coast Guard, has been successfully tested by the Air Force.

The Air Materiel Command, Wright-Patterson AFB, Dayton, Ohio, began research on this project in 1946. The unit is based on the Minneapolis-Honeywell E-6 automatic pilot used on the B-36 and B-50 bombers.

Conventional plane auto pilots have not been alert enough to fly skittish helicopters. The helicopter pilot flies the rotors of his ship, and with each change of direction the cabin tends to swing to and fro like a clock pendulum. To compensate for this pitch and roll the helicopter pilot must keep his mind and hands on the controls at all times.

(*Continued on page* 54, *col.* 1)

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Contracts Coming In Volume

(*Continued from page* 46)

top staff assistants to speed up the organization of the division. In addition, it will mean that conferences can be held by Mr. Daley and Mr. Parris and their top staff aides with groups from the equipment and component companies in the electronics-radio field in more orderly fashion than exists in the present quarters. In the latter offices, three men, including Mr. Daley, are in a single office, and in Mr. Parris' office there are four officials with desks crowded almost against each other.

Two more staff officials have been added to the division. They are J. A. Milling, vice president of the RCA Service Co., and John J. Dennis, who served with the War Production Board's radio and radar division. The division's industry advisory committees are being completed, with the last of the nominees having been submitted, but the slow process of their activities still remains.

General Harrison, defense production administrator, in a February 1 address in New York, forecast that a controlled materials plan will be established soon to channel adequate critical materials into defense armament production. The target is to build up sifficient equipment for U. S. combat forces on full mobilization by 1953. If the economy is expanded to provide full mobilization equipment production with increased supplies of critical materials, General Harrison said, industry can look forward to a removel of controls.

A breakdown into broad categories of equipment in the $854 million funds for procurement of electronics-radio apparatus by the Air Force Materiel Command was as follows: airborne electronics equipment for the new airplanes under manufacture, including radio compasses, flier-controlled and bombing radar, alti-

meters, and command radiocommunications equipment—$370 million; modernization of equipment in present airplanes and at airfields—$398 million; conversion of existing equipment, both airborne and ground, from VHF to UHF, and airborne and ground point-to-point communications and airborne and ground electronic navigational systems, such as GCA, ILS, and Loran, and the air defense radar network, including the equipment, land and buildings—$468 million; and logistical support, communications and electronics equipment—$86 to 95 million.

Although there have been some published reports indicating that aircraft manufacturing companies might start in the electronics equipment manufacturing field, it is understood authoritatively only about 5% of the total Air Force requirements are being procured from this industry.

In fact, the Hughes Aircraft Co. up to the present is the only supplier producing guided missile and proximity fuze electronic apparatus, but the Glenn Martin Co. was said to be considering entering the field. Aircraft manufacturers are engaging substantial staffs of electronic engineers, such as the new electronic division of the Curtiss-Wright Corp., but chiefly these are for supervising installations in the newly produced airplanes, with the equipment supplied by the electronic-radio manufacturing indstry. The division has been formed at the Curtiss-Wright plant at Caldwell, N. J.

The General Electric Co., it was announced recently by vice president and general manager W. R. G. Baker of the electronics department, has received a $1.3 million contract from the Signal Corps for transportable microwave communications equipment.

This microwave apparatus, which incorporates the best modern features of radio and telephone equipment, proved most valuable in Korea, even in the latter's mountainous terrain. The Signal Corps order included equipment for terminal and repeater stations, with complete standby equipment for each, and the automatic repeater station feature is especially valuable for combat communications.

Included in the new British armament budget announced in early February by Prime Minister Atlee are certain to be substantial allotments for communications and electronics-radio equipment. The Prime Minister revealed that the expenditure for arms production for the next fiscal year will be double that of the current year. This amount will be quadrupled by the end of three years.

It was believed that major suppliers in Great Britain will be manufacturing companies like the Standard Telephones & Cables Ltd., Standard Telecommunications Laboratories, Creed & Co., and International Marine Radio Co., all International Telephone & Telegraph Corp. affiliates; Electrical & Musical Industries, Ltd.; Marconi Wireless Telegraph Co.; and Automatic Electric Co. of Liverpool.

The Department of Defense research and development board announced January 31 a new policy formula to guide the Army, Navy and Air Force in their support of basic research, which will mean a fixed percentage of each military department's average annual total research and development budget for the last five fiscal years. The RDB's formula provides that the total Defense Department basic research expenditure must be as least $30 million in a fiscal year and this policy will be in effect for three years.

The NPA in its issuance of further control orders on the allocation and distribution and usage of short-supply critical materials and metals, continued reaffirmation of the policy of trying to take care of essential industries and services and to curb the use of these materials for luxury and non-essential lines.

Pinches are showing up in certain fields, one of them the tightening of plastics as synthetic rubber production rises, because of many of the chemicals and raw materials going into the latter with diversion from the plastic industry.

The Department of Comerce has rapidly expanded the number of its field offices, now totaling 73, compared with the previous 42, to take care of the fast-growing program of NPA, it was reported.

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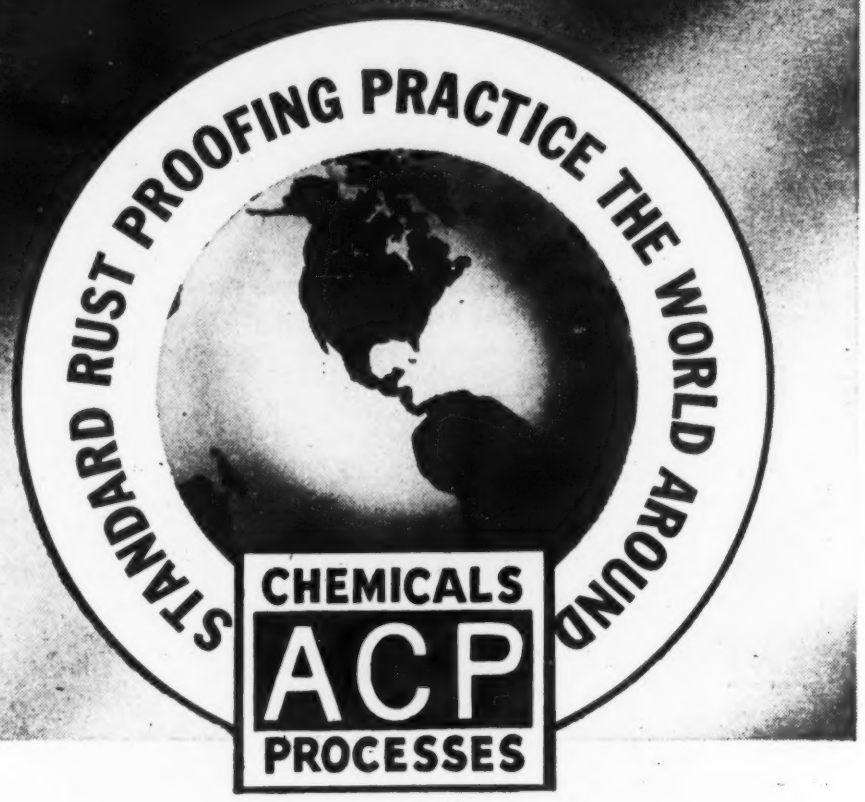

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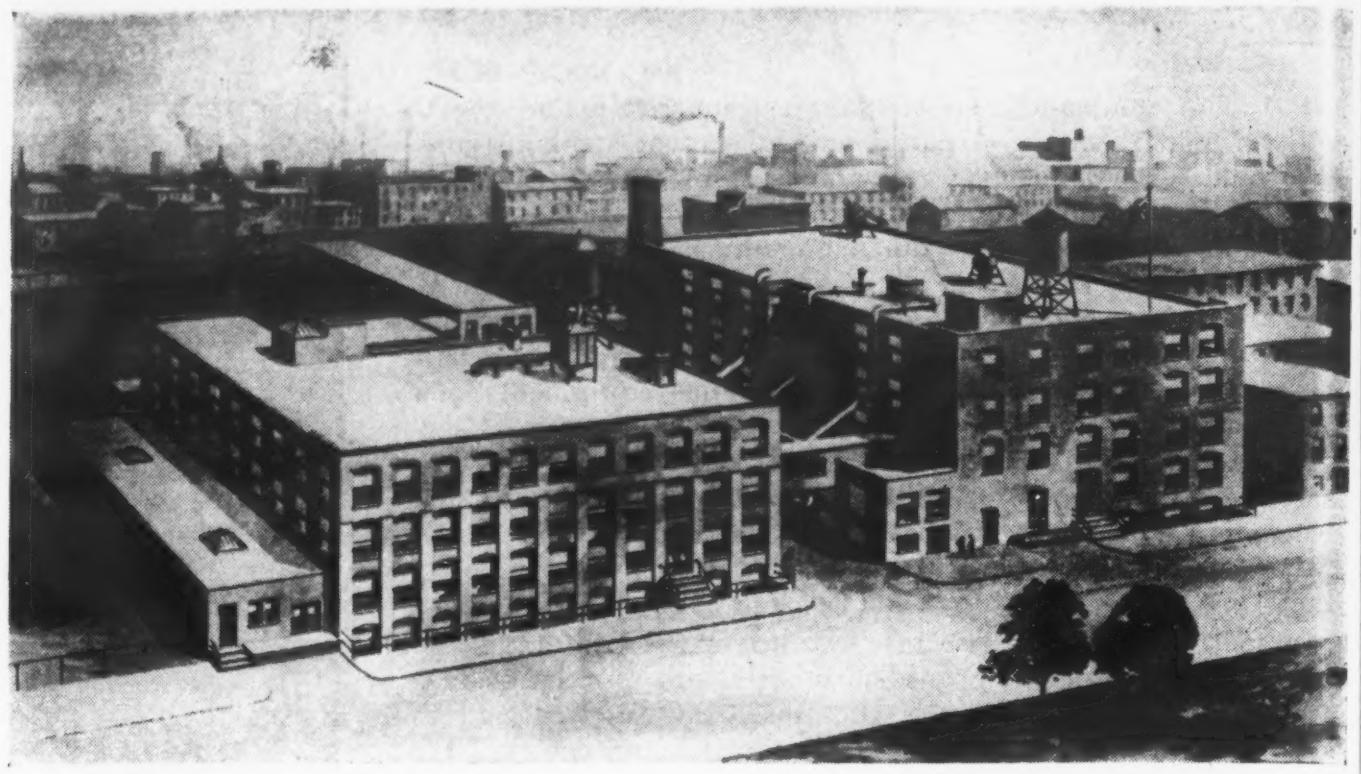

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NEWS

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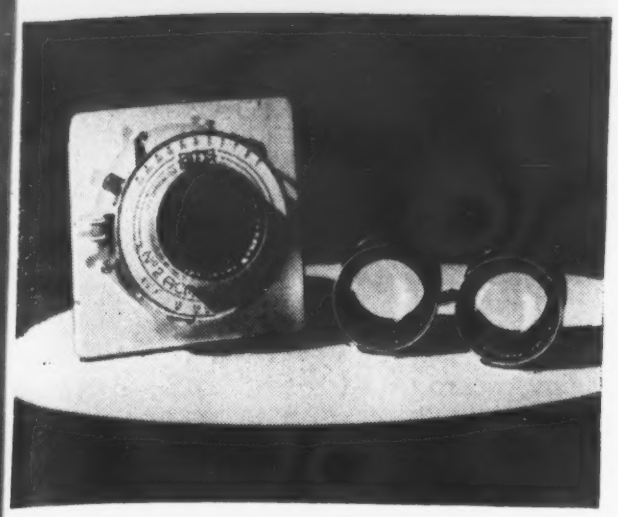

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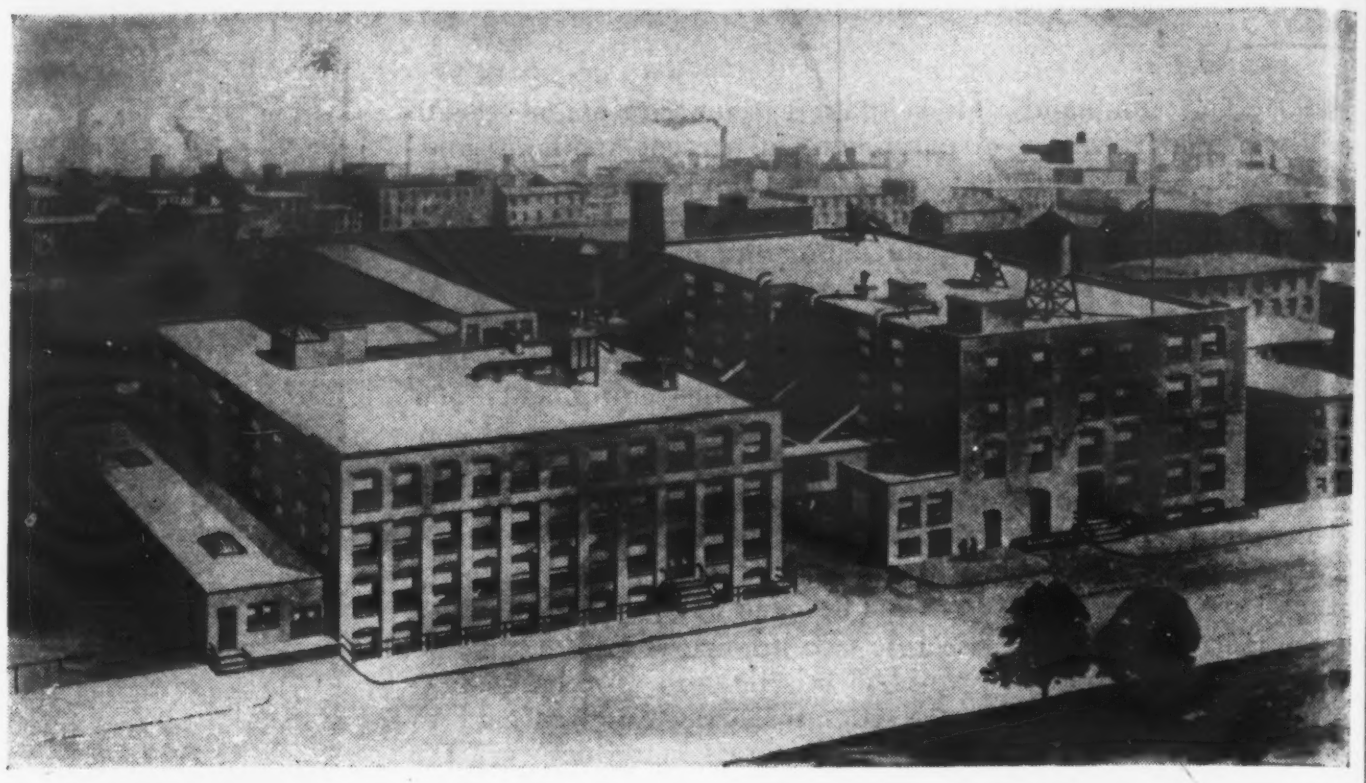

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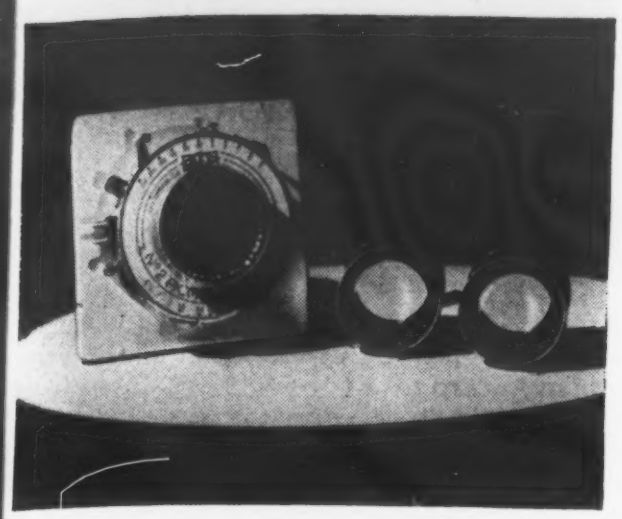

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NEWS

Kidwell to First Army

Colonel Francis E. Kidwell, who has been serving as executive officer in the OCSigO since 17 March 1950, left Washington on February 12 to take over shortly thereafter the responsibilities of signal officer of the First Army with headquarters at Governors' Island, N. Y.

Prior to his assignment in the OCSigO Colonel Kidwell had served as signal officer of the U. S. Army Group in Greece from January 1948 until his return to the States in February 1950. His wartime assignments included service as plans and training officer of the signal section of the Allied Force Headquarters in London; signal officer of the advance command post, Allied Force Headquarters at Constantine, Malta, and Sicily; and deputy signal officer of the Fifth Army in Italy.

Wakeman to Camp Gordon

Colonel P. A. Wakeman, who had been signal officer of the First Army since September 1948, and who was succeeded by Colonel Kidwell on February 12, has been assigned to duty at the Signal Corps Training Center, Camp Gordonn, Ga.

Vitzthum Assistant Supply Chief

Colonel Harry L. Vitzthum has been designated assistant chief, procurement and distribution division, OCSigO, replacing General Elder who became chief of the division February 1, following the retirement of General Shearer. Colonel Vitzthum had been commanding officer of the Sacramento, Cal. Signal Depot since March 1949. During the first year of World War II Colonel Vitzthum was post signal officer at Fort Richardson, Alaska, and back in the States was assigned for a brief period to the Army Communication and Coordination Agency. He next became a member of the Army Communications Board of the War Department General Staff, later was assigned to the communication coordination committee, OCSigO, following which he was appointed director of the control division, OCSigO.

Lieutenant Colonel Changes

James M. Kimbrough, designated assistant chief, personnel and training division, OCSigO; *Lowry R. Moore*, chief, military training branch; *George E. Pickett*, to Armed Forces Staff College, as student; *Joseph W. Shamel*, chief, civilian components branch; *Richard W. Waters*, civilian components branch, personnel and training division; *Eric R. Osborne*, to Army communications service division.

Other Changes

Captain Philip M. Drew, to plans and operations division, OCSigO; *First Lieutenant Alfred E. Bohnert*, signal plans and operations division.

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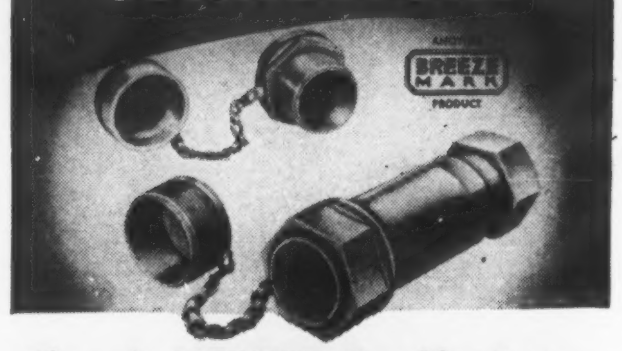

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(*Continued from page* 9)

ting separation-filter which permits simultaneous transmission of two carriers from one array. These filters employ concentrated tuning circuits, permitting operation over the radio frequency range of 52-68 MC/s, transferring 3.0 KW with an attenuation of less than 0.2 Db and offering a blocking attenuation of at least 30.0 Db.

Fig. 3 shows details of the receiving-separation-filters. These also are tunable within the 52-68 MC/s range and provide a blocking attenuation of 35 Db with a transmission loss of less than 2.6 Db.

Limited study of the propagation characteristics of the path indicates a definite sensitivity to thermal and air turbulance factors. Propagation is very good when the sky coverage is 100% over the entire path and usually during hours of darkness.

The received field intensity curve, shown in Fig. 4, are for a better than average day during one month of summer operation. The solid, horizontal line represents the design field-intensity of 60 microvolts per meter. Circuit failure effectively occurs at 20 microvolts-per-meter, (the dotted, horizontal line) and discriminator saturation occurs at 1,000 microvolts-per-meter.

In conclusion, it should be noted that the path is a difficult one. As a point of interest, the monographic data contained in an article, "VHF Field Intensities," by Mr. E. A. Slusser in the July, 1950 issue of *Electronics*, checks the measured, average field intensity with reasonable accuracy.

In brief, the circuit works better than some early predictions and worse than some early claims. It will, however, furnish valuable experience data for a long, defiladed, VHF path.

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I. T. & T.

(*Continued from page* 20)

don; and Laboratoire Central de Telecommunications, in Paris. Together, they employ approximately 1300 persons. In addition to these laboratories, there are research divisions in all important IT&T factories. Furthermore, IT&T operating companies throughout the world test new equipment, make suggestions, and, in varying degree, participate in the constant search for improvement.

The technical director of IT&T initiates and directs all programs of research and development that are System-wide in scope; he also maintains general supervision of projects undertaken by the individual companies. The IT&T Technical Board, of which the technical director is chairman, exists to prepare technical policy and review development programs, taking into consideration the views and requirements of the System as a whole. The board is

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►The Zero Reader performs for jet fighters the same job it does for commercial and executive aircraft such as the Beechcraft and Douglas DC-3—simplifying flying, navigating and making manual approaches for pilots.

►The Zero Reader tells the pilot directly on a simple two-element indicator how to move the controls so as to fly the correct flight path with ease and precision. It combines the type of information usually supplied by the gyro-horizon, directional gyro, magnetic compass, sensitive altimeter and cross pointer meter.

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I. T. & T.

(*Continued on page* 56)

composed of the most highly qualified technicians within the various fields of IT&T research and development, together with representatives of the engineering, manufacturing, commercial, operating and patent departments. Technical committees that include representatives of all System organizations interested in a particular technical field meet periodically to exchange views and make detailed recommendations in furtherance of it.

Typical of IT&T's modern research facilities is the plant of the Federal Telecommunication Laboratories, with its 300-foot aluminum-sheathed microwave tower dominating the North Jersey landscape. An integral part of the ultra-modern laboratory building, the tower is designed to provide the highly exacting conditions required for research in the higher frequencies. Here, experiments are conducted in a variety of fields, with aerial navigation aids, television, frequency and pulse-type modulations and facsimile systems for broadcasting receiving primary attention.

Telephone Communication

IT&T began its career in 1920 with telephone companies in Cuba and Puerto Rico. Within a decade, it had organized or purchased other telephone companies in Argentina, Brazil, Chile, China, Mexico, Peru, Romania, and Spain. Most of these operate by the usual landlines. However, radiotelephone was employed some 15 years ago, in Chile, to link remote localities with the main network; and today, in Brazil, IT&T is operating a telephone system by means of radio.

IT&T is prepared to undertake the reorganization, expansion, and modernization of national telephone systems even if the government's ultimate aim is to purchase and operate the network after its rehabilitation. Of the three governments that have done this—Argentina, Romania, and Spain — each contracted for continued technical advice and equipment from IT&T at the time of purchase.

Except for China, IT&T telephone operating properties now are limited to the Western Hemisphere. In Chile, Cuba, and Puerto Rico, IT&T companies have nationwide networks comprising the great majority of telephones in those countries. In Brazil, there are two IT&T companies operating by landline in the southern states of Parana and Rio Grande do Sul, in addition to the radiotelephone network already mentioned. In Mexico, a partially-owned IT&T company, Teléfonos de Mexico (Telmex), operates the national telephone system, while, in Peru, an IT&T telephone operating associate serves Lima and its outlying districts. Altogether, over half a million stations are presently in service.

Telephone service by IT&T companies is not limited by national boundaries. In fact, it has been estimated that 90 percent of the telephones in South and Central America and the West Indies are linked with one another and with Europe and North America through IT&T facilities.

Cable and Radiotelegraph

The American Cable & Radio Corporation, an IT&T associate, is the only American-owned international telegraph carrier offering worldwide service by both cable and radio. Among its associated companies are All America Cables and Radio, Inc., The Commercial Cable Company, and Mackay Radio and Telegraph Company. These and other IT&T companies in South America operate approximately 47,000 miles of submarine cable, more than 8,800 miles of landline, and over 70 international radiotelegraph circuits.

Marine Communication

The two most important IT&T associates in the field of marine radio are the Marine Division of Mackay Radio and Telegraph Company, New York, and the International Marine Radio Company Limited, Croydon, England. Both companies have played important parts in developing marine communication. Mackay pioneered commercial shore-to-ship radiotelegraph service in the United States as early as 1914, and today operates 10 powerful shore stations for communication with ships at sea.

IMRC was organized in 1930 to install and operate aboard British merchant vessels the commercial Radiotelephone equipment that IT&T laboratories had been instrumental in developing. The company rapidly expanded into allied fields and was awarded contracts by Cunard White-Star, Ltd., to install and operate the complete telephone and telegraph equipment, and the usual navigational and safety devices, aboard its fleet, including the *Queen Mary*, the *Queen Elizabeth*, and the postwar *Caronia*. These installations were designed by IMRC, and much of the equipment involved was manufactured by associated IT&T companies.

Technical Advisory Service

For the operation of its varied activities, IT&T has built up a staff of experts unique in their experience of rehabilitating and expanding telecommunication services and factories in many lands. Where IT&T is retained as a consultant, it makes available its technical advisory service for the solution of problems involved in the construction and maintenance of physical plant, the training of employees, the choice and application of operating techniques and financial procedures, and the establishment of satisfactory public relations.

Export Activities

Export to foreign countries and possessions is normally handled in one of two alternate ways—through an export department maintained in New York City by IT&T's associate, International Standard Electric Corporation, or through more than 250 sales outlets maintained by that Corporation or its subsidiaries outside the United States. For the convenience of its customers, ISE also maintains an engineering division that will survey, plan, and estimate the cost of projects ranging from a single radio transmitter to complete telegraph, telephone, and airport installations.

During the first decade of its existence, IT&T built a worldwide telecommunication and electronic industry second to none in the extent and variety of its activities. During the next decade and a half, IT&T survived storms of depression, revolution, and war that overthrew strong governments and the League of Nations, the gold standard and multilateral trade. Since the war, IT&T has greatly expanded its manufacturing position in the United States, where it now ranks among the leaders in its field.

Today, IT&T is supported in both hemispheres by research laboratories whose achievements are generally recognized. Its products can be manufactured locally, if markets warrant, by 32 associated factories in 21 countries. Where local manufacture is not warranted, equipment is supplied, installed, and maintained by a sales and service organization with outlets throughout the world.

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"Jim Creek"

(*Continued from page* 16)

of time. This will be the world's highest powered VLF radio transmitting station. It will have a power of 1000 kilowatts, twice that of LUALUALEI, and will be capable of really worldwide coverage. Although of the same output as Radio Lafayette, the use of a vacuum type transmitter will make the new station approximately six times as effective.

The transmitter itself was manufactured by RCA at Camden, N. J. and is designed to be used at a power of either 1000 kilowatts or 500 kilowatts. When operated at the lower power, a complete spare 500 kilowatt unit is available for alternate use. The frequency range is 14 to 35 kilocycles.

The antenna system will consist of ten catenaries spanning Jim Creek Valley. These catenaries will be suspended from 200 foot towers on the tops of Wheeler and Blue Mountains. The catenaries will be 5640 to 8700 feet in length, with actual radiators approximately 5000 feet in length. Downleads, averaging 1200 feet in length, will be connected to two central bus feeders. Each bus will consist of a conductor 26 inches in diameter and will be supported on 14 towers about 140 feet in height.

The transmitter building is the heart of the Jim Creek Station. Its general arrangement is functional. All unnecessary features have been eliminated. Because of the unique equipment to be

Mr. W. G. TINKER, *service manager, The Petersen Oven Co., Franklin Park, Ill. writes:* "We have about 20 Amprobes which are used in the field by our oven erection superintendents, and we intend to supply all of our 27 men with them. We find the Amprobe most useful for testing motor loads and line voltage."

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— J. E. Schilling, Schilling Chilling Co., Indianapolis, Ind.

"Very handy for quick check on motor loads without any shut-down time".
— E. J. Wynne, Foreman, Walter Baker Div., General Foods, Dorchester, Mass.

AMPROBE®

the only pocket-size snap-on volt-ammeter

"Jim Creek"

(*Continued from page* 58)

located in the transmitter building, a number of unusual features have been incorporated into its design. Reinforced concrete construction is used. As a result of the unfortunate experience at LUALUALEI all the reinforcing steel is spot welded together at every intersection and in turn, grounded at intervals of not more than 5 feet around the perimeter of the building to a copper mat. This ground mat extends underneath the entire building and approximately 30 feet beyond the outer walls. The magnitude of the radio frequency field requires the installation of noncombustible roofing material. All roof areas are covered with sheet copper which is connected to the copper ground mat. The building is without windows. This design feature serves two purposes.

First, it reduces the amount of dust that will get into the building; and second, it provides a certain amount of security from blast damage.

Because of the power involved, the helix rooms require a space approximately 75 feet square and 60 feet high, completely shielded with copper.

The antenna buses from the transmitter building come out the sides through 20 foot square ports which are provided with copper covered canopies to keep out snow and rain. This arrangement will be discarded when a bushing is developed which will permit running the buses vertically through the roof. In anticipation of this, soft patches approximately 15 feet in diameter have been provided in the roof slabs in the center of each helix area.

The terrain is such that a very limited space is available for building construction. To secure the required space, the course of JIM CREEK has been diverted. Electronic considerations have dictated that an area 1600 feet in diameter around the transmitter building be cleared of nearly all vegetation. Approximately 1500 acres of additional space must be cleared to a lesser degree.

Excessive erosion would be detrimental since it would reduce the conductivity of the ground. It would also tend to fill JIM CREEK and increase the possibility of floods. Therefore, steps must be taken to stabilize the slopes of the valley. Since the area under the antenna system must be maintained clear of objectionable growth over the years, the cost of future clearing operations must be considered. Studies have indicated that the cleared areas should be planted with low growing shrubs such as snowberry, salmonberry and spirea. These shrubs will provide sufficient roots to keep the top soil in place. Growths such as alder and maple must be eliminated in order to avoid expensive clearing operations in succeeding years. Consideration is being given to poisoning such objectionable growths.

One of the electronic requirements for a station of this type is a ground system under the antenna. For ideal operations a considerable portion of the valley should be copper plated. Obviously, this cannot be done. However, a reasonably accurate substitute is being provided. Radial wires will extend 2500 feet from the copper mat under the transmitter building. These wires will be spaced at angular intervals of one degree twenty minutes. A large portion of the area to be covered consists of rock out-croppings. For this reason special means are being devised to prevent the wires becoming displaced by debris. The wires will also complicate the problem of soil stabilization. In areas where soil is available, they will be buried at least one foot below the surface.

Another problem which has required careful study is the power supply for the station. The total load is estimated to be 2500 kilowatts. Of this, 1800 kilowatts represents the power required by the transmitter plate circuits. This is the load which is flashed on and off as the transmitter is keyed. The design of the tubes is such that voltage variations in excess of five precent may cause failure. It is obvious that the power supply must be designed for very close regulation. The main supply will come by a transmission line from a power substation at the town of Arlington, about 12 miles away. Diesel generators will be provided for emergency operation.

The magnitude of the JIM CREEK installation is dramatic proof that LF and VLF radio have vital roles to play in naval communications. The Navy is proud to have pioneered in this field and proud of the achievements of the communication industry in providing the equipment.

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Horne Speech

(*Continued from page* 24)

operate in this band. However, since it cannot be stated without qualification that all of the functions required can be accomplished in these bands, investigations must be carried out to determine the practicability of combining the functions. Certain other functions such as landing monitoring, airport surface movement and position determining will operate in their allocated bands. It is emphasized that the foregoing radio frequency spectrum requirements do not represent the entire frequency requirements of the aviation service.

Point to point communication in the future will be provided by interphone equipment, automatic air traffic control point to point equipment, and microwave and/or coaxial cable point to point relay circuits. Interphone equipment of the ultimate system will be required to handle aural intercommunication between ATC centers, aircraft operating agencies, weather bureau offices, air terminal control towers, and related units essential in the functioning of Air Traffic Control System. The interphone system may function as the primary means of intercommunications between ATC units in low density traffic areas and as a secondary communication means in areas where air traffic density is high and control is achieved largely through automatic traffic control facilities.

The interphone system should provide an integrated means for full duplex voice telephone communication between two stations, among several stations, or among all stations within an ATC area. Extension of the interphone system through one or more ATC areas should be possible. The signal level at a receiving station should be maintained substantially constant regardless of the station of origin in the System. Means to signal stations on the system and selective and multiple signalling functions should be provided. The selective signaling means should function rapidly. Signaling should involve an overall time delay which is small compared to the twenty second duration of the average communication.

Increased emphasis is required on improved pre-flight planning to afford increased utilization of airway and airport facilities. It has been recommended that automatic ATC point to point communications be provided by a telegraphic code over wire facilities between airway traffic control towers, and points along the route of the aircraft, and points within the area of the airway traffic control center. The communication system shall be based upon the use of a five-element telegraphic code. It shall operate to transmit aircraft flow information in a sequential manner and shall be capable of expansion in message capacity by use of coordinated facilities. Transmission characteristics of the communication system shall be such that they are reliable over any distance required by air traffic control coordination. The communication system shall have a minimum speed of transmission in the range 200 to 300 characters per minute and anticipate a maximum rate of 600 to 700 characters per minute. The equipment used for transmitting aircraft flow information should be capable of selective message routing. The errors introduced in the transmission of messages should not exceed one ten thousandth of 1% of the total numbers of characters transmitted. The communication equipment should be capable of storing messages until such time as wire facilities are available for re-transmission. The storage equipment shall be located at each transmitting or receiving point associated with aircraft flow information.

Some areas of the country, due to the high density of air traffic, will require the transmission of intelligence, the type and volume of which cannot be efficiently handled by the ordinary landline wire circuits. In these areas, traffic control facilities will be inter-

(*Continued on page* 64, *col.* 1)

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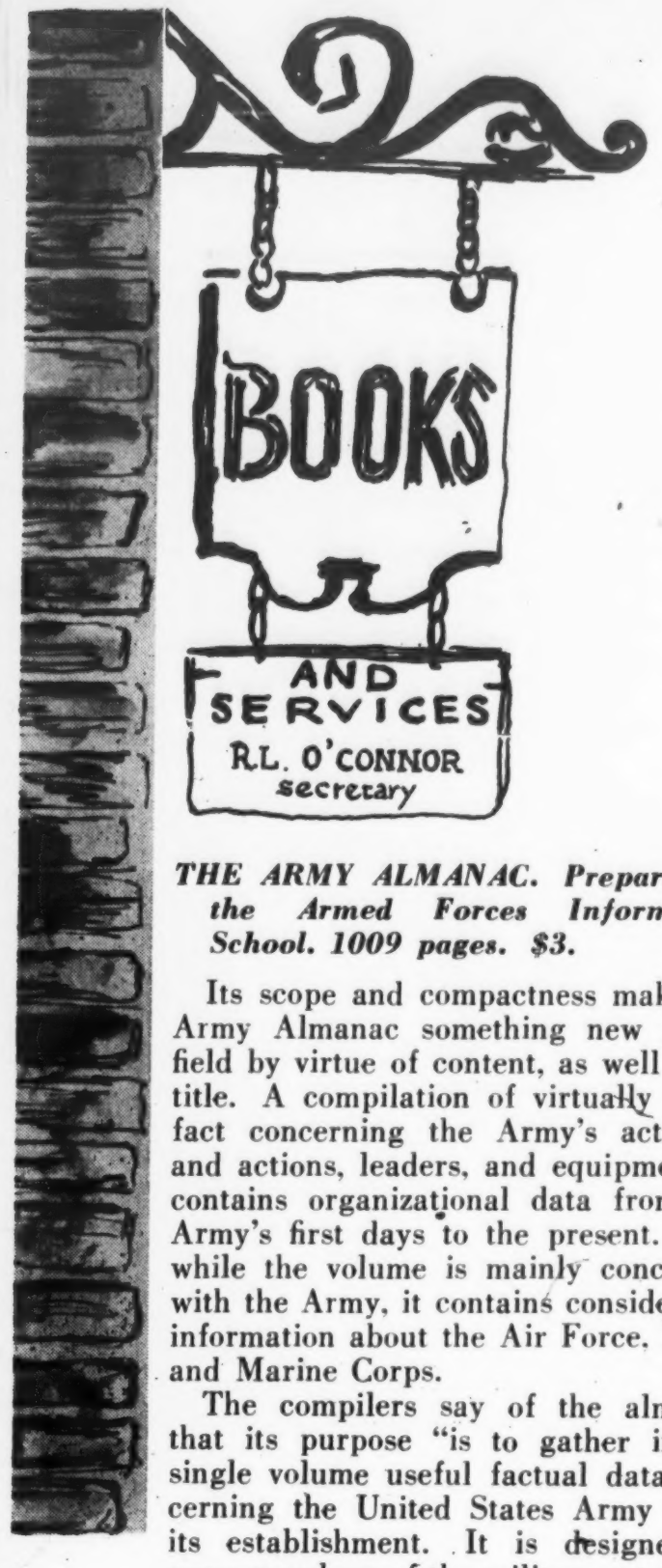

THE ARMY ALMANAC. Prepared by the Armed Forces Information School. 1009 pages. $3.

Its scope and compactness make the Army Almanac something new in its field by virtue of content, as well as in title. A compilation of virtually every fact concerning the Army's activities and actions, leaders, and equipment, it contains organizational data from the Army's first days to the present. And while the volume is mainly concerned with the Army, it contains considerable information about the Air Force, Navy, and Marine Corps.

The compilers say of the almanac that its purpose "is to gather into a single volume useful factual data concerning the United States Army since its establishment. It is designed to serve members of the military establishment as a handy reference source, and to provide editors, commentators, and others concerned with public information, an organized body of material about the Army."

In their endeavor the compilers are successful, and the almanac is recommended to anyone who would find the information contained of use in his work or research.

Since the almanac is the first of its kind it is presently in its first edition, which should give it some value in iteslf as a collectors' item.

DUNLAP'S RADIO & TELEVISION ALMANAC. By Orrin E. Dunlap, Jr. Harper & Brothers. 211 pages. $4.

For thirty years the author has been compiling this almanac of facts, dates, and people in the history of radio and television. The chronological record begins with the first rudimentary discoveries in electronics in the seventeenth century, and carries right up to the year 1950. It covers not only techincal developments but the history-making events in such fields as international affairs, national politics, sports, aviation, the arts, for which radio and television have served as prime channels of public information. The almanac includes also a record of the officials, past and present, of the various radio and television trade associations, institutes, and commissions. A detailed index of names and subjects provides complete cross reference to the chronological historyl. The almanac is illustrated with over sixty "then and now" photographs dramatizing the progress of radio and television.

The author, Orrin E. Dunlap, Jr., was for many years radio editor of *The New York Times,* is a Senior Member of the I.R.E., and a vice president of the Radio Corporation of America.

RADIATION MONITORING IN ATOMIC DEFENSE. By Dwight E. Gray and John H. Martens. D. Van Nostrand Company, Inc. 122 pages. $2.

Of timely interest to radiological personnel in civilian defense and the armed forces, this book on measurement of atomic radiation is based on the radiological plans and techniques as developed by the Federal Civil Defense Administration and the Atomic Energy Commission.

The radiation monitor, or geigerman, needs information not only about the nature, characteristics, and operation of his instruments, but, if he is to do his work properly, about certain fundamentals of atomic enerby and the release of atomic radiation. He must know too the relation of atomic radiation to the dangers and phenomena which accompany an atomic explosion. This book is designed to supply these needs.

The authors: Dr. Dwight E. Gray has worked with the technical information aspects of guided missiles as well as with the Atomic Energy Commission, and is currently chief of the Navy research section of the Library of Congress. John H. Martens was associated with the Manhattan District from 1943 to 1945 and subsequently has worked for the Atomic Energy Commission at Oak Ridge, Clinton Laboratories, and at Washington. He served as a monitor in Operation Crossroads. Educated as a chemist, he became in recent years a specialists in atomic information.

COYNE TELEVISION CYCLOPEDIA. By Harold P. Manly. Educational Book Publishing Division, Coyne Electrical and Television - Radio School. 740 pages. $5.95.

This television cyclopedia lists subjects alphabetically, dictionary style. And the subjects are treated thoroughly enough as to make each definition actually a short article. Each "article" was written to meet the needs of the beginner, but at the same time offering much that is new to those with field experience in radio or television.

The editors state that their purpose in selection and treatment of material used to produce a book "completely covering each subject so that there can be doubt in the mind of the reader."

CHIEF OF STAFF: PREWAR PLANS AND PREPARATIONS. By Mark S. Watson, Office of the Chief of Military History, Department of the Army. 520 pages. $3.75.

The dramatic impact of military operations sometimes over-shadows the equally dramatic preliminaries — the plans and preparations of the Army's chief of staff. This book presents to public view the monumental task of transforming the nation from peacetime military famine to optimum wartime efficiency. In a sense it is the story of General George C. Marshall, who filled the post of chief of staff from September 1939 to November 1945.

Like other volumes in *The U.S. Army In World War II,* of which this is the sixth, *Chief of Staff* is a scholarly and objective work. Mr. Watson, the author, was a war correspondent during the war; his dispatches to the *Baltimore Sun* won the Pulitzer Prize for international correspondence in 1945.

ECONOMICS OF NATIONAL SECURITY. Edited by G. A. Lincoln, W. S. Stone, and T. H. Harvey. Prentice-Hall, Inc. 601 pages. $6.65.

Now more than ever it is vitally important for every American to understand how economics affects our naitonal security, for the art and science of economics is perhaps the most important support of the United States way of life in its struggle for survival with an opponent — communism — that expects and gives no quarter.

Economics of National Security sets forth a comprehensive account of the scope and nature of economic problems which have arisen from our country's anti-aggression policy. The authors treat with such aspects of the total security picture as wartime emergency organization; the economic effects of our alliances with other nations, the current industrial mobilization program, how the armed forces buy goods, principles of war finance, and economic control of the home front — prices, rationing, wages, and manpower.

Aluminum Protection Booklet

An article on "Amorphous Phosphate Coatings For Protection of Aluminum Alloys and for Paint Ahesion," by Alfred Douty and F. P. Spruance, Jr., originally presented at a onational convention of the American Electroplaters' Society, has been prepared in booklet form by the American Chemical Paint Company. By courtesy of that firm the booklets are made available to SIGNAL readers without cost. Address requests to the editor.

German Wartime Communications Survey

"Telecommunications and Equipment in Germany during the period 1939-1945" is one of a series of surveys on German wartime industry made by the British Intelligence Objectives Sub-

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committe. The communications report, which is the 29th in the series, and the latest completed, is a thorough report covering research and development, transmission, exchange equipment and manufacture, telegraph, subscribers' apparatus, radio and television.

Copies of the report, in booklet form, are available at 40c each from the British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

National Best Sellers

Compiled on a Percentage Basis from the Reports of 59 Booksellers as listed in Publisher's Weekly for January 13.

FICTION

1.	Joy Street, *by Frances Parkinson Keyes*	$3.00
2.	The Disinherited, *by Budd Schulberg*	$3.50
3.	Son of a Hundred Kings, *by Thomas B. Costain*	$3.00
4.	The Cardinal, *by Thomas Morton Robinson*	$3.50
5.	The Adventurer, *by Mika Waltari*	$3.50
6.	The Little World of Don Camillo, *by Giovanni Guareschi*	$2.75
7.	Across the River and Into the Trees, *by Ernest Hemingway*	$3.00
8.	Bennett's Welcome, *by Inglis Fitcher*	$3.50
9.	Jubilee Trail, *by Gwen Bristow*	$3.00
10.	Pathway to the Stars, *by Harnett Kane*	$3.00

NON-FICTION

1.	Kon-Tiki, *by Thor Heyerdahl*		$4.00
2.	Boswell's London Journal		$5.00
3.	The Hinge of Fate, *by Winstn S. Churchill*		$6.00
4.	Out of This Wlrod, *by Lowell Thomas, Jr.*		$3.75
5.	Look Younger, Live Longer, *by Gayelord Hauser*		$3.00
6.	Belles on Their Toes, *by Frank B. Gilbreth, Jr. and Ernestine Gilbreth Carey*		$3.00
7.	The Decline and Fall of Practically Everybody, *by Will Cuppy*		$3.00
8.	Nuts in May, *by Cornelia Otis Skinner*		$2.75
9.	Life's Picture History of World War II	$10.00	$12.00
10.	Fifty Fabulous Years, *by H. V. Kaltenborn*		$3.50

Insignia of the Association

AVAILABLE TO MEMBERS FROM THE SERVICE DEPARTMENT

The Association insignia in several beautiful designs and convenient styles authorized for wear by members is available at the prices quoted below. Order from AFCA Service Department, 1624 Eye St., N. W., Washington 6, D. C. The insignia is described as follows:

The central figure is an alert powerful American eagle with strong talons clutching lightning flashes—symbolic of a strong America and national defense—especially insofar as modern communications is concerned, our basic reason for existence. The border consists of leaves of the olive branch of peace, showing that the object of military preparedness in America is to assure a lasting peace. In the background are signal flags—the first means of signalling in sea and land warfare by United State forces. Just above the eagle and between his outstretched wings is a heavy bomber in flight, symbolizing the complicated and essential communications in the Air Force, and in Naval and Marine aviation. Above that is a radar antenna array, and at the very top a radio rely antenna—for the latest major step in military communications. And none of these could exist without industry—the foundation of AFCA. In the color version there are the traditinal colors of the signal flags—dexter white with red center and sinister red with white center—with a gold border to the whole.

Members should take every opportunity to display AFCA insignia. Worn on the uniform or civilian dress, or displayed on home or office wall, it carries with it an identification of distinction, is decorative, and helps to widen the scope of our Association by bringing it to the attention of others. Emblem is available in a variety of attractive forms.

ASSOCIATION MEDAL

Wrought on the medal in sharp and bold relief is the AFCA insignia. 1⅜ inches in diameter (shown at the right, actual size), the medal is suspended from a ribbon of heavy grosgrain silk in orange and dark blue. The medal is authorized for wear on the uniform as provided in A.R. 600-40, paragraph 68g and 70c (2) (dated 31 March 1944). Prices: $3 in bronze, $4 in silver, $5 in gold. Medal is not available for sale to student members.

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MEMBERSHIP CERTIFICATES

Printed on fine diploma paper with the Association emblem in full color and the member's name engrossed.
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DECALCOMANIAS

Decalcomanias of the association insignia are now available from the service department. Three inches in diameter, in full color (eagle and wreath in bronze, red and white signal flags, against a silver-gray background) these decals can be transferred from either side to glass, or any other smooth solid surface, so that they will appear to be painted on that surface.

Price—4 for $1.

Our Book Department can furnish any book currently in print. We will also help to secure older titles that you may need to complete your library. A 10% discount is allowed all Association members on orders of $2.50 or more. Please indicate author and publisher where known, and allow three weeks for procurement and delivery.

Horne Speech

(*Continued from page 60, col. 3*)

connected by either microwave radio links or coaxial cable. It is quite evident that this so-called "broad band" communication technique will prove of considerable advantage in eliminating the serious limitations imposed by ordinary radio or landline circuits.

Much research and development is required before the optimum bandwidth requirements of air traffic control system linkage circuits can be determined. Operational requirements dictate that the development work must produce a balanced system. Terminal and linkage equipments capable of handling the variety and complexity of messages and intelligence required for the operation of the ultimate automatic air traffic control system must be developed.

Our objective is to provide a safe and effective all-weather air traffic control and navigation system for all users of the airspace which will at the same time, be available as an effective national defense weapon.

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Electronics Technical School

(*Continued from page 22*)

Each student is permitted four failures involving "repeats," and a fifty failure usually causes him to be dropped. This is not a hard and fast rule, however, and each case is handled individually on its particular merits. The Navy never lets a prospective ET go unless convinced that the student is beyond reasonable hope.

Attrition was more than twenty-five percent two years ago, but now hardly ever exceeds four percent. The improvement is due in part to more careful selection of students and in part to improvement in teaching techniques and curriculum brought about by the development board described above.

Instructors are provided roughly in a one to ten ratio to students. All are specially chosen men and ninety percent of them are graduates of one of the Navy's four-week instructor training schools. Most are chief or first class petty officers.

ET school is the largest of seven training schools making up the Service School Command at Great Lakes, commanded by Captain W. M. Foster, USN. The officer in charge of the school is Lieutenant Commander J. J. Bartko, USN.

Internally the school falls into two departments. One is the electronics department, headed by Lieutenant Commander A. J. Bosselett, USN, handling logistics, installation of new equipment and major repairs. The other department is charged with instruction and administration. It is headed by Lieutenant Commander S. C. Miller, USN, with the combined titles of technical training officer and assistant officer in charge. There are also assistant technical training officers for the two instruction phases, which are conducted in separate buildings.

The first phase of ET school began operation at Great Lakes during World War II, graduates then going on to the Naval Research Laboratory in Washington, D. C., for fifteen weeks of practical work. On July 12, 1948, the second phase was transferred to Great Lakes, where a building costing more than two million dollars had been constructed to house it.

This building, its roof covered with varied types of radar screens, is a showplace for tourists visiting Great Lakes. It contains thirty-one laboratories, a like number of classrooms, offices and a large maintenance shop. Approximately fifteen million dollars worth of latest model electronic equipment is installed and bright red "Restricted Area" signs are prominent in the interior. Obsolescent equipment is almost constantly being removed to make way for new and improved replacements. In general, Navy training needs are met from the first ten percent of production of any new equipment.

The ET student who completes the school can look back on a worthwhile achievement. He can get academic credit for it in many high schools and in some colleges. He can also look forward to an interesting career in the Navy with prospects of advancement very much better than those for most other ratings.

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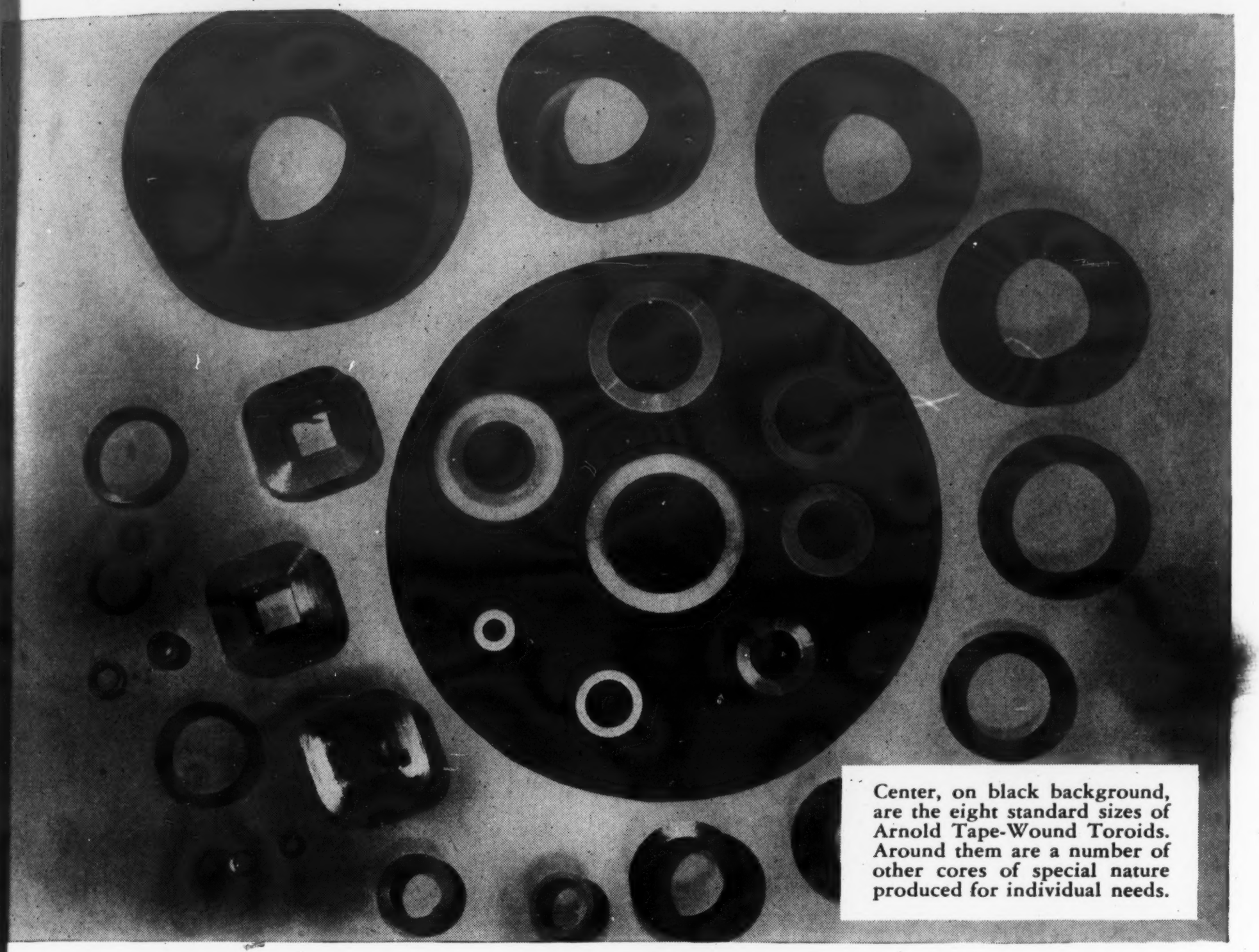

Center, on black background, are the eight standard sizes of Arnold Tape-Wound Toroids. Around them are a number of other cores of special nature produced for individual needs.

ARNOLD TAPE-WOUND TOROIDAL CORES

of DELTAMAX 4-79 MO-PERMALLOY SUPERMALLOY*

In addition to the standard toroids described at left, Arnold Tape-Wound Cores are available in special sizes manufactured to meet your requirements—toroidal, rectangular or square. Toroidal cores are supplied in protective cases.

Manufactured under licensing arrangements with Western Electric Company.

W&D 3182

APPLICATIONS

MAGNETIC AMPLIFIERS
PULSE TRANSFORMERS
NON-LINEAR RETARD COILS and TRANSFORMERS
PEAKING STRIPS, and many other specialized applications.

RANGE OF SIZES

Arnold Tape-Wound Toroids are available in eight sizes of standard cores—all furnished encased in molded nylon containers, and ranging in size from ½" to 2½" I.D., ¾" to 3" O.D., and ⅛" to ½" high.

RANGE OF TYPES

These standard core sizes are available in each of the three magnetic materials named, made from either .004", .002" or .001" tape, as required.

THE ARNOLD ENGINEERING COMPANY

SUBSIDIARY OF ALLEGHENY LUDLUM STEEL CORPORATION

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Manuels Branch. Electronics Div.
Air Command & Staff School
Building 42
Maxwell Air Force Base, A.a. C-12-51

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1932
1933
1934
1935

1948
1949
1950
1951

of electronics leadership

1929—Auto Radios

1937—Home Radios

1940—FM 2-way Radio

1942—Handie-Talkie Unit

1947—Television

...and now the new 1951

Motorola TV

From the beginning, Motorola engineers have pioneered in electronic research and development. The result has been a remarkable record of *FIRSTS,* including the famed Motorola "Handie-Talkie"* unit, the car radio, and today — television receivers that are *years ahead* in styling, performance, and *value.* You can depend on Motorola electronics experience for the very finest in communications and entertainment.

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